SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXV.—No. 22.
ESTABLISHED 1845.

NEW YORK, NOVEMBER 28, 1896.

$3.00 A YEAR.
WEEKLY.

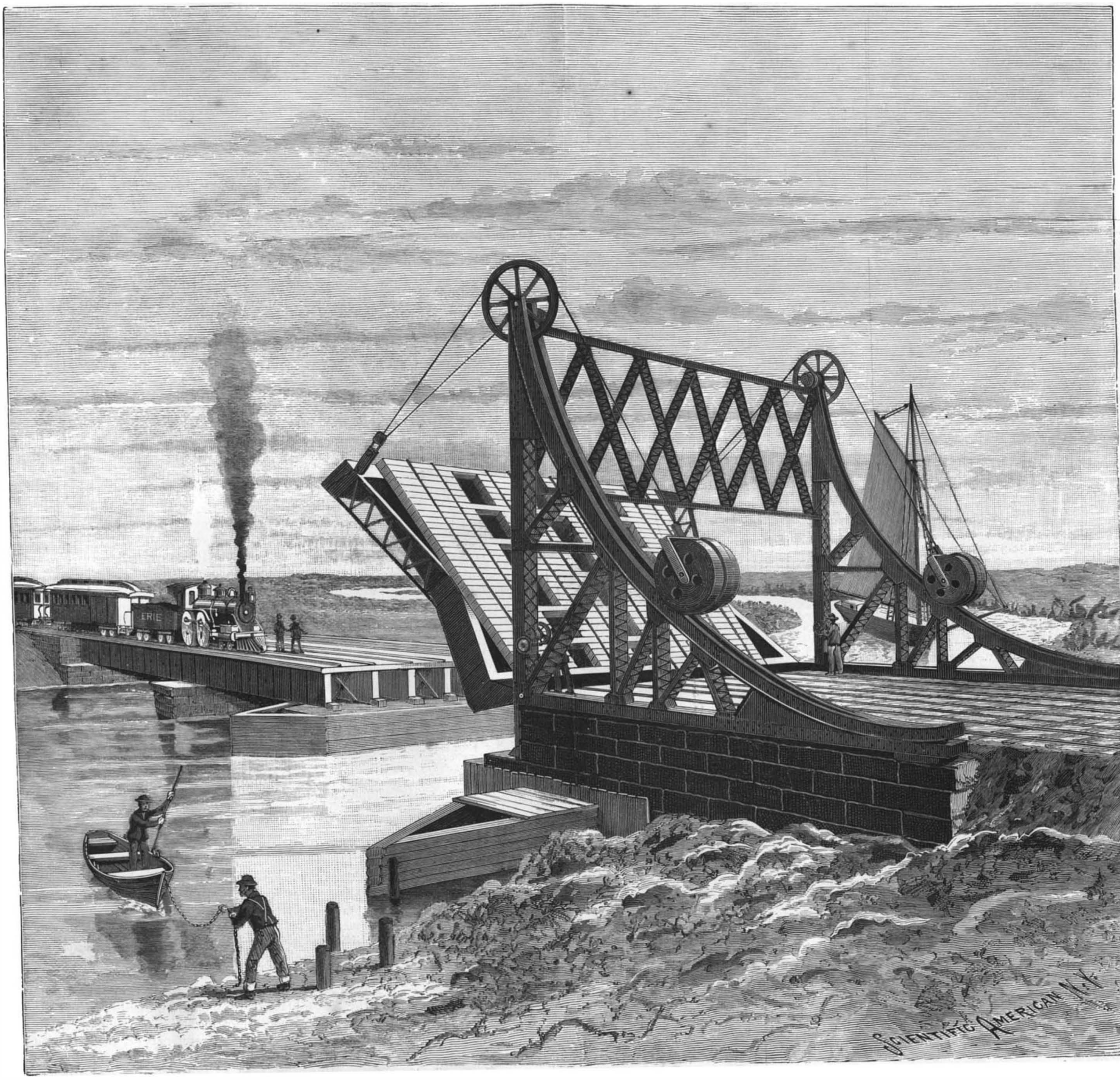
COUNTERWEIGHTED LIFT BRIDGE ON THE ERIE RAILROAD.

We present in this issue a perspective view of a counterweighted lift bridge which has recently been opened across Berry's Creek, near Rutherford, N. J., on the main line of the Erie Railroad. Although the principle upon which the bridge is constructed is not entirely new, the Berry Creek bridge is the first application of this system of counterweighting to a structure of this magnitude. The crossing consists of two fixed spans 50 feet long and a draw span 32 feet long, center to center of bearings. The whole structure is four-tracked, and on account of the great width (44 feet center to center of outside girders) as compared with its length of 32 feet, it was deemed advisable to lift the draw rather than turn it. The draw itself consists of four spans of ordinary deck plate girders, one beneath each rail. The spans are framed as stringers to a header girder at each end, and they are so braced together that when the draw is raised the header girders form the chords of a deep truss, and are, therefore, subject to direct tension and compression, the shear being carried to the end stringers by the bracing. The hoist ropes are attached to the ends of the outer header girder, as are also the counterweight ropes, any bending moment that is caused by the pull of these ropes being resisted by the latticed struts shown at the sides of the draw. The hinges are located at the ends of the shore girder, and the reaction when the bridge is raised is transferred to them by struts similar to those above mentioned, except that they are made of plates and angles.

The bridge is balanced by means of weights rolling upon tracks, which are so curved that the work done by the weights in dropping from one position to another equals the work to be done in raising the bridge to a corresponding position. It will be evident to our readers that if the counterweights were permitted to fall vertically, the bridge would be raised at an accelerating speed, and would be brought up violently against the vertical posts of the counterweight frame; and this, for the reason that, while the pull on the counterweight end of the rope would be constant, the pull of the bridge as it was raised would constantly decrease, the weight being taken by the hinges.

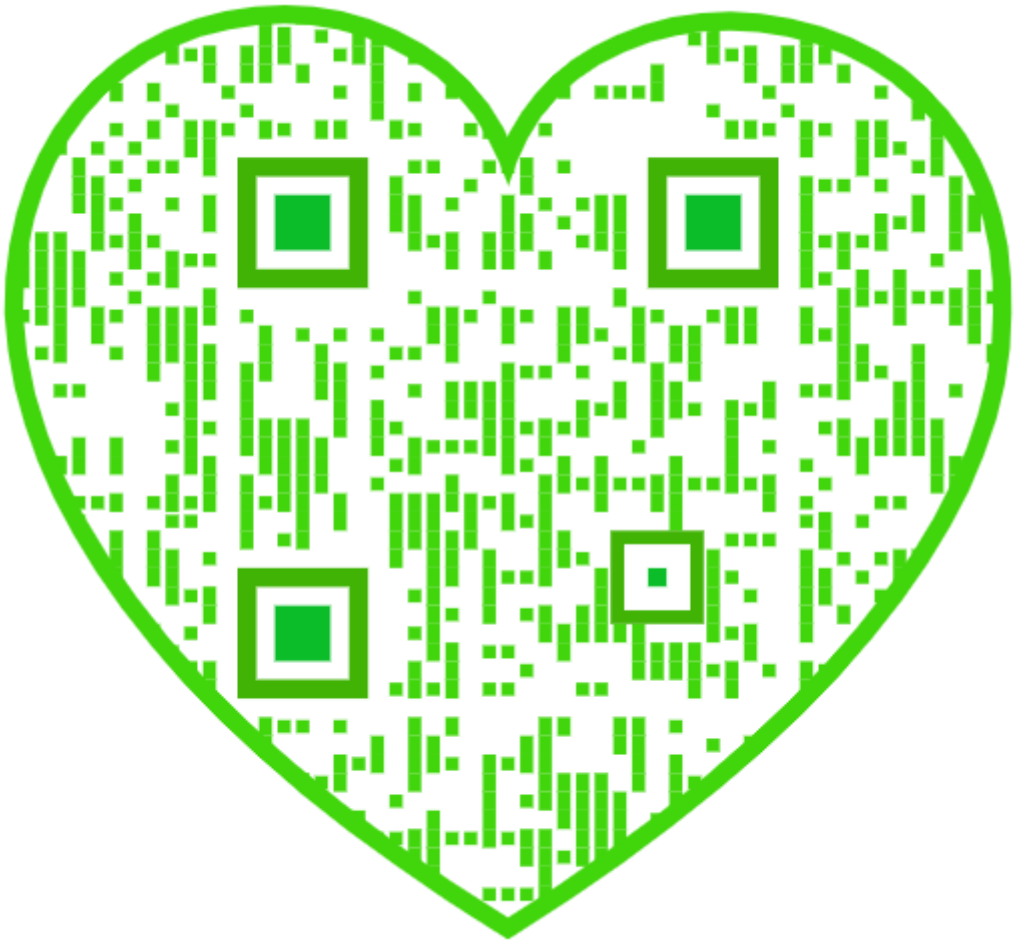
To compensate for the decreasing load of the bridge, the counterweights are run out upon a curved track, the curve being so regulated that the counterweight and the bridge shall be almost in equilibrium at any position. The weights, however, are made less than the weight of the draw span, the difference being that which closes the draw.

The office of the hoist ropes above mentioned is to lift this difference of weight. They run over 23 inch sheaves at the top, and down to winches at the bottom of the posts, which are arranged to work by hand power. These sheaves are connected at the top by a shaft and gearing, so as to insure that the men on either side will work evenly. The counterweights, each of which weighs about 25 tons, consist of two sets of



COUNTERWEIGHTED LIFT BRIDGE ON THE ERIE RAILROAD, NEAR RUTHERFORD N. J.

© 1896 SCIENTIFIC AMERICAN, INC.



nine cast iron disks, 6 feet in diameter, which are solid except for four holes in which cast iron adjustment weights can be placed for regulating the load. The counterweights run upon tracks which are built of two 15 inch channel beams spaced 20 inches apart, the tracks being braced to the posts and the bottom member by means of lattice struts and ties as shown in the illustration. The two frames are kept in line by the latticed portal, which is 16 feet deep. The inshore end of each counterweight frame is anchored down to the foundation masonry by two 1¾ inch bolts. The hoist ropes are $\frac{9}{16}$ of an inch and the counterweight ropes 1¾ inches in diameter; the latter consisting of six strands of nineteen wires wound around a hemp center. The total weight of the draw span is 138,120 pounds, and the counterweights can be so nicely adjusted, if it were desired, that one man could open and shut it in three or four minutes. The structure was built by the Union Bridge Company, of New York City, under the direction of C. W. Buchholz, chief engineer of the Erie Railroad, to whom we are indebted for the above particulars.

Transmission of Power from Niagara Falls to Buffalo Completed.

Immediately after midnight, in the early hours of Monday, November 16, the Niagara Falls Power Company made its first transmission of electric power from Niagara to Buffalo, when a current of 1,000 horse power was delivered at the station of the Buffalo Railway Company. The occasion is notable as being the first practical example of the much talked of "harnessing of Niagara" for transmission of its mighty water power to a distance. Upon the commercial success of the Buffalo venture will depend the more extensive transmission of this vast storehouse of natural energy to the various manufacturing centers that lie at a greater distance. It was on March 31, 1886, that the Niagara Falls Power Company was incorporated. The Construction Company was organized in 1889, and work was begun on October 4 of the following year. It took three years to build the tunnel, the surface canal and the first wheel pits. The canal, 250 feet wide, with an average depth of 12 feet, draws off sufficient water from the Niagara River, a mile and a quarter above the falls, to serve for the development of 100,000 horse power. The walls of the canal are pierced at intervals with ten inlets for the delivery of water to the wheel pit in the power house, which stands at the side of the canal. The pit is 178 feet deep and connects by a lateral tunnel with the main back to the river below the falls. The tunnel, which has a maximum height of 21 feet and width of 18 feet 10 inches, was a large undertaking, involving the labor for over three years of 1,000 men, the excavation of over 300,000 tons of rock, and the use of 16,000,000 bricks for lining.

In view of the unprecedented nature of the undertaking, it was decided to throw the matter of designing the electrical plant open to international competition, and two prizes were offered "for the most efficient method of converting falling water into rotary motion and of transmitting the rotary motion or power to a greater or less distance." The turbines were built after the accepted designs of Messrs. Faesch & Piccard, of Geneva, Switzerland. They work under a head of 140 feet and each develops 5,000 horse power. After a careful investigation of the power transmission plants of the world, the International Niagara Commission adopted a two-phase alternating electric generator of 5,000 horse power, developing about 2,000 volts. The first installation consists of three generators, designed by the company's electrical engineer, Prof. George Forbes, of London, and built by the Westinghouse Company. The weight of each generator is 170,000 pounds. A fully illustrated description of this plant appeared in our issue of January 25 of this year.

The first distribution of power was made to the works of the Pittsburg Reduction Company, adjacent to the canal, in August, 1895. Other and later users of the power have been the Carborundum Company, the Calcium Company, the Buffalo & Niagara Railway Company and the Niagara Falls Electric Lighting Company.

In December, 1895, the city of Buffalo granted a franchise to the company to supply power to that city, under the terms of which it must be prepared to furnish 10,000 horse power to consumers by June 1, 1896, and 10,000 additional horse power in each successive year. The first customer under this arrangement was the Buffalo Railway Company, which arranged to take 1,000 horse power, at a rate of $36 per horse power per year. The current is transmitted by a pole line, consisting of three continuous cables of uninsulated copper, the total length of which is 78 miles.

To meet the future demand, the Niagara Falls Power Company is preparing to install seven more generators of 5,000 horse power each, which will be exactly similar to those already in place. When the necessary extensions have been made, the pit will be 430 feet long and 185 feet deep, and the total capacity of the plant will be 50,000 horse power, or one-half of the capacity of the canal.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

TERMS FOR THE SCIENTIFIC AMERICAN.
(Established 1845.)

One copy, one year, for the U. S., Canada or Mexico.....$3.00
One copy, six months, for the U. S., Canada or Mexico..... 1.50
One copy, one year, to any foreign country, postage prepaid £0 16s. 5d. 4.00

Remit by postal or express money order, or by bank draft or check.

MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement
(Established 1876)

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year, or £1 4s. 8d., to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S. Canada or Mexico, on receipt of *seven dollars*. To foreign countries, *eight dollars and fifty cents a year*, or £1 14s. 11d., postage prepaid.

Building Edition of Scientific American.
(Established 1885.)

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendidly illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To architects, builders and all who contemplate building this work is invaluable.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign countries, $3.00 a year, or £0 12s. 4d. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign countries, $6.50 a year, or £1 6s. 9d. Combined rate for BUILDING EDITION SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign countries, $11.00 a year, or £2 5s. 2d., postage prepaid.

Export Edition of the Scientific American
(Established 1878)

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN, published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 100 pages, profusely illustrated. It is the finest scientific industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. $3.00 a year, or £0 12s. 4d., post paid to any part of the world. Single copies, 25 cents.

MUNN & CO., Publishers, 361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

☞ Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, NOVEMBER 28, 1896.

Contents.

(Illustrated articles are marked with an asterisk.)

Babylonia, discoveries in..... 398
Bicycle riding, learning..... 398
Brass lacquer (7030)..... 401
Bridge, lift, on the Erie railroad* 389
Electric power transmission..... 390
Elk horn fence, an..... 398
Fishes, nest building..... 398
Fruits, salted..... 394
Icelandic features, remarkable.. 399
Inventions recently patented.... 400
Lantern slides, toning..... 398
Liquid measuring device, Curtis*..... 392
Melinite, French experiments 391
Motor carriage race, English.... 395
Niagara Falls power transmission..... 390
Patent and trade mark decisions 395
Patent practice and a lottery system..... 390
Patents as investments..... 393
Patents, copies of, delayed..... 391
Picture frame composition (7029) 401
Phonograph, the multiplex*..... 393
Rain experiments..... 393
Ravenna, tomb of Theodoric at* 397
Science notes..... 395
Sight of school children..... 395
Street railways of Berlin..... 398
Sunfish of the Pacific, the*..... 399
Telescope without observatory*. 392
Trade, German..... 394
Tugs carried by steamers 399
Wars, Victorian..... 393
Wire gun construction..... 391
Wire-wound gun, the Brown*.... 396

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 1091.

For the Week Ending November 28, 1896.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ANTHROPOLOGY.—The British Association.—Anthropology.—Presidential address by ARTHUR J. EVANS on the present aspects of this interesting branch of science..... 17432

II. ASTRONOMY.—Depths of the Heavens.—A vivid and picturesque description of the cosmic system as disclosed by modern astronomers.—By Prof. ROBERT BALL..... 17438

III. AUTOCARS.—Oil Traction Engines and Locomotives.—Powerful traction engines operated by Hornsby-Akroyd engines—2 illustrations..... 17442

IV. AVICULTURE.—The Flight of Birds.—The rapidity of the flight of birds and speed attained by homing pigeons..... 17435

V. CIVIL ENGINEERING.—Suspension Bridges.—A study.—By GEORGE S. MORISON.—A very valuable paper on long span suspension bridges, with special reference to the spanning of the North River, New York, with estimate of cost.—5 illustrations.... 17444
Note on the Swiss Railway Tunnels..... 17438

VI. ENTOMOLOGY.—The Tent Caterpillar.—By CLARENCE M. WEED.—Ravages committed by a great insect pest of New England, with numerous illustrations and methods of destroying it.—14 illustrations..... 17436

VII. FINE ARTS.—Note on Fourteenth Century Frescoes Recently Discovered in Italy..... 17443

VIII. GUNNERY.—The Scurimobile.—A curiosity in gunnery.—A rifle shooting in two directions at once. 1 illustration..... 17443

IX. HORTICULTURE.—Trichopilia Coccinea.—A beautiful flowering plant from a Zurich horticulturist.—1 illustration..... 17438

X. METALLURGY.—Note on Aluminum Amalgam..... 17433

XI. METEOROLOGY.—The Tidal Wave in Japan.—A further description of the dreadful accident in Japan due to the great tidal wave.—2 illustrations..... 17431

XII. MISCELLANEOUS.—Armenia and Its Patriarch.—Notes on the Armenian question, with portrait of the Patriarch of Armenia and representative Turkish types.—2 illustrations..... 17434
The Royal Kitchen, Windsor.—The great kitchen of Windsor Palace, with notes on the palace and forest.—1 illustration..... 17435
Note on the Use of Machinery in Factories in Baden..... 17439
Engineering Notes..... 17440
Electrical Notes..... 17440
Miscellaneous Notes..... 17440
Selected Formulæ..... 17441

XIII. NAVAL ENGINEERING.—Breyer's Water Velocipede.—A curiosity in naval work.—A boat propelled by and sustained by its screw propellers..... 17443
Engines of Torpedo Boat Destroyers Salmon and Snapper.—Recent engines for high speed ships for the English navy, with records of trial.—1 illustration..... 17439

XIV. PHYSICS.—Apparatus for Eliminating Vibration from the Supports of Delicate Instruments.—An apparatus for avoiding the effects of vibration upon delicate physical instruments.—1 illustration..... 17443

XV. TECHNOLOGY.—The Boyer Automatic Suspension Hook.—An eccentric hook adapted for picture hanging, construction of book cases and many similar purposes.—4 illustrations..... 17441
The National Condiment.—The production of sauces in factories, with characteristic anecdotes..... 17435

THE LOTTERY SYSTEM AS APPLIED TO PATENT PRACTICE.

We publish on another page an abstract of a paper read by Mr. Albert Scheible before the Chicago Electrical Association. In it the subject of patents is considered from the ethical and practical standpoint, and the conclusions reached by the author are at once conservative and just. The article is most timely, for in this country the need of a reform of patent practices in certain directions was never more urgent than now.

Two or three factors underlie the relation of inventor and patent attorney, factors similar to many which are discernible in other relations of life. The inventor requires good service; his work must be executed up to the highest standard, and such work has to be paid for. Any system which purports to give such service for other than adequate compensation, by that fact makes itself an object of suspicion. Impartiality must characterize the solicitor's work. No human being can pronounce upon the merits of an untried device, and the attorney, among the many subjects for patents which are placed in his hands, must have no favorites.

The attorney, therefore, must hold a definite business relation to the inventor and the latter must feel that he is getting in the services of a thoroughly competent solicitor the best value for his expenditure of thought, time and money. His view of the case eliminates side issues. Flattery of the inventor and the skillful raising of his expectations, touching his vanity and his desire of pecuniary returns by specious promises, should not form part of the transactions.

Unfortunately, the hard working necessarily imaginative inventor has long been a subject for attack by a class of patent attorneys who apply all the methods of commercial life to getting money out of him. They will give no honest opinion as to the possible patentability of a device, because their first and only thought concerns their fees. These can only be earned by bringing the case before the Patent Office, and any doubts on the part of the inventor must be overcome by persuasion. He must be made immediate use of, and his invention is mature, from the standpoint of the unprofessional solicitor, as soon as it can be enticed into the office to yield a return in fees.

Every now and then a peculiarly flagrant example of unprofessional practice comes to the surface and seems to cast a shadow on the whole profession.

Thus a firm of patent solicitors may convert their business into a lottery system, and undertake to persuade inventors to submit themselves and their inventions to a chance competition. A system of prize awards for assumed meritorious invention, a system including cash awards and silver medals, incredible as it may seem, has actually been inaugurated by a concern of patent solicitors. Periodically the cash prize is given for the "most meritorious and simplest invention."

Only one inventor gets the prize, and for the consolation of his less fortunate brethren silver medals are issued galore. These medals are cheap affairs, but they are calculated to tickle the vanity of the thoughtless.

Should such an institution as the Franklin Institute, of Philadelphia, the American Institute, of New York, or other association of that character issue medals for real merit, there would be some discernible raison d'être. The impartiality of the judgment and the purity of the motives underlying the establishment of such a competition would be evident, as there would be no oblique motive discernible. But in the case we cite, it is a firm of private patent solicitors who, in order to boom their own business, offer these prizes, which are paid for indirectly by the inventor.

The value and significance of the award, even of the grand prize, may, however, be gaged by the fact that it happens that, in spite of the strenuous efforts of these attorneys to prevent such a result, the invention for which the prize was awarded is rejected at times by the Patent Office, and the patent refused.

The motives of the system are so clear that little sympathy seems due those who suffer by it.

The reduction of the profession of patent attorney to the low grade marked by this lottery system is to be greatly deplored. The cheap medals and insignificant cash prizes, the publishing of portraits of the victims in a cheap journal, under the same control, are simply "chromos," with which to attract customers. They combine patent soliciting with alleged patent selling and promoting, and sugar the whole with foolish awards.

The evils of such practice are great. The inventor has always been at a disadvantage in the business world, as his habits of thought, as set forth in the lecture above referred to, are not always those requisite for pecuniary success. The methods we have described are adapted simply to lead him on by appealing to the gambler's spirit in human nature. What is the cure and how are practices such as those we have described to be prevented?

After an inventor has secured a patent his standing in the federal courts protects him, but his path to the Patent Office needs guarding. The establishment of a patent bar, long since and frequently advocated, would seem the least that should be done for the protection of inventors from men of the class we speak of. At

© 1896 SCIENTIFIC AMERICAN, INC.

present the patent solicitor is nearly exempt from supervision, the Patent Commissioner having the right to suspend him from practice for only the worst and most obviously dishonorable practices which come under his personal cognizance after the case is filed in the Patent Office. The raising of the standing of the patent solicitor to a high professional level and the maintenance of the character of the profession is a question of the first importance. The establishment of a patent bar, subject to proper extent of jurisdiction by the Commissioner of Patents, would at once do away with the evils described. Meanwhile the inventor can protect himself to some extent by consigning suspicious firms to the oblivion which they richly deserve.

WIRE GUN CONSTRUCTION IN THE UNITED STATES.

In its recent recommendation to the Secretary of War that an allotment be made from the experimental fund for the manufacture of a ten inch experimental wire gun, the Ordnance and Fortification Board has shown a commendable desire to keep abreast of the times in the matter of heavy gun construction. In view of the uniform excellence of the results obtained with the hooped guns which have already been built for the army and navy, it is natural that ordnance officers should have looked rather coldly upon the wire-wound gun, which is built upon a system so radically different from their own. The fact, however, that they are prepared to spend $33,000 in the construction of an experimental weapon of the new type shows that they are fully alive to its great possibilities, and are determined to ascertain by practical proof the limits of its power and endurance.

On another page will be found drawings and a description of this gun, which will be sufficiently detailed to make clear to our readers the theory and method of its construction. While the subject is of great intrinsic interest as embodying one of the most brilliant applications of science to mechanics of the present day, it also has a very serious and practical value to the country at large. Recent developments in gun and armor construction—the high resistance of the one and the enormous pressures and velocities in the other—point to the universal adoption at no distant date of some system of wire-wound gun by the makers of the world.

The introduction of nickel steel and the Harvey system of face hardening has increased the resistance of armor plate so enormously that the foreign gun makers have been obliged to raise the velocity of the projectiles far above the 2,000 feet per second which was standard in foreign countries a few years ago, and is standard in this country to day. The value of high velocity was clearly shown last September at the Indian Head proving grounds, when two 6 inch Johnson shots were fired at a 10 inch reforged nickel steel plate. The first shot, striking at the standard velocity of about 2,000 feet per second, broke up on the plate with eight inches penetration; whereas the second shot, delivered at 2,500 feet per second, made a clean penetration, and was picked up comparatively uninjured. As an instance of the high velocities which are in use abroad, it may be mentioned that the service guns of the British navy develop 2,400 feet per second; Armstrong's guns, 2,642 feet; Krupp's rapid fire guns, 2,625 feet; and Canet's rapid fire guns as high as 3,281 feet per second, all of which, of course, represents a corresponding increase in energy and penetration.

Now there are two ways in which the velocity may be increased. The gun may be lengthened and the powder gases given a longer time to exert their elastic force upon the projectile, or the length may be left the same and a quick burning powder, exerting very high pressures, may be used. In each case the resulting velocity at the muzzle will be the same; the low pressure throughout the long bore producing the same ultimate acceleration as the high pressure throughout the short bore.

At first sight it would seem advisable, on account of its lighter weight and convenience in handling, to build the shorter type of gun and use the higher powder pressures; but as a matter of fact the makers of built-up guns have not been able to turn out weapons of that type that will safely carry such pressures; and they have been driven to the alternative of lengthening the gun, until in the case of such weapons as the Canet 4·72 inch rapid fire gun it has reached the absurd and unwieldy proportions of 80 calibers. The objections to such guns, especially on shipboard, are many and obvious. They are difficult to balance, require large turret space, and the abnormally long chase is liable to be struck by the rapid fire shells of the enemy. In addition to this, such long guns will be relatively very heavy. From the above considerations it is to be hoped that, when the United States adopts high velocities, as it must shortly do, it will not attempt to secure them by increasing the length of the gun at the expense of its handiness.

On the other hand, the alternative method of employing high powder pressures calls for a gun of great elastic strength. Where it is a comparatively simple matter to construct a weapon capable of resisting the 16 to 18 tons per square inch pressure of the built-up gun burning slow powder, it is another proposition altogether to provide for the 25 to 30 tons pressure set up by the smokeless powders, and it is doubtful if the builders of hooped guns will ever successfully accomplish it. To give the necessary elastic strength to withstand such enormous strains, the metal of the gun must be subjected to an amount of mechanical working which the process of hooped construction will not admit of.

It is just here, in the mechanical manipulation which can be given to the metal of its segmental core and the wire wrapping, that the Brown wire gun is so admirably adapted for high powder pressures. The core has an elastic strength of 126,000 pounds, and the wire an elastic strength of 230,000 pounds to the square inch. The wire winding sets up such a high degree of initial compression in the segments of the bore that even under the highest powder pressure the compression at the surface of the bore will not be reduced to zero; that is to say, the interior lining of the gun will never be thrown into tension, and the pressure will be directly resisted by the wire wrapping.

Of course there are other questions besides that of power and handiness which will have to be considered, chief among which is that of endurance. This can only be determined by a prolonged series of tests such as the Ordnance Board is about to undertake. But if the segmental wire gun should develop no minor defects, it is certain that its enormous power in proportion to its weight will place it far in advance of the present style of gun. This is evident from a comparison of the proposed gun with the standard 13 inch gun of the service.

Style of Gun.	Caliber.	Weight.	Velocity.	Energy.
Hooped.	13 inch	60·5 tons	2,100 foot sec.	33,627 foot tons
Segmental wire....	10 "	30 "	3,000 " "	37,800 " "

Such figures as these speak for themselves, and further comment would seem to be superfluous; but we would point out in closing that by adopting the wire gun the Indiana, without reducing the energy per round of her main battery, would be able to put half of its present weight into larger coal supply or higher speed or better accommodation for her crew, and at the same time greatly increase the number of rounds which she could deliver in a given time. If the system were applied to her 8 inch and 6 inch batteries, there would be a proportionate decrease in weight and increase in efficiency.

DELAY IN FURNISHING COPIES OF PATENTS.

The recent reduction in the price of copies of patents, which went into effect July 1, 1896, has so greatly increased the demand that the Commissioner of Patents has been quite unable to keep the patent attorneys promptly supplied. In many cases these gentlemen have had to wait three or four days for copies which they required in prosecuting preliminary examinations and in other professional work for their clients, and as a consequence they have been blamed for a vexatious delay for which they were in nowise responsible. The commissioner admits the existence of this grievance, but says that he is powerless to remove it, for the reason that he has not the necessary funds to pay the extra force that would be needed to supply the copies as fast as they are required.

We think it is unfortunate that the finances of the Patent Office should be cut down to such a close margin that they cannot deal with a slight emergency such as this. A department whose operations are so far reaching should present some degree of elasticity in the matter of working expenses. The delays and losses which may arise from any kind of a deadlock in the operations of the Patent Office are of a nature that cannot be measured in dollars and cents, and we trust that this very serious exception to the otherwise admirable management of this department will be removed at an early date.

Dispatch and the general economy of time should be—as we believe in general they are—one of the first considerations in the planning and execution of the routine of Patent Office business; and as the present delay has grown out of special conditions, the public have every reason to hope that they will be promptly met and provided for.

Motor Cars on the Brooklyn Bridge.

The new electric motor cars to be operated on the Brooklyn Bridge, and which are to take the place of the old switching engines, are being tested, and so far have proved successful. On November 14 one of the twenty new cars was run over the bridge several times. It was tested by Chief Engineer Martin, who ascertained that from the time the bell sounded to the time the motor switched a train and got back on the siding ready for another train only forty-three seconds had elapsed, a saving over the old method of thirty-seven seconds.

It is Mr. Martin's intention to have the new motors put in operation on the bridge in a few days. The new power house will be ready about the first of the year, and then the motors will be run regularly, and trains will be run on forty-five seconds headway.

Experiments with Melinite at Avignon.

The experiments recently made at Avignon by the seventh regiment of engineers, by order of the Minister of War, are of great importance from a military view point. The object that the authorities had in view in trying them was to obtain an accurate idea of the effects produced by melinite when employed in large quantities, and to compare them with those produced by blasting powder.

It was necessary to proceed with extreme prudence, since it was a question of bringing into play 3,300 pounds of powder on the one hand and 2,750 pounds of melinite on the other. The ravages caused by powder were already known, but the same was not the case with regard to the effects of melinite employed in such a quantity, and the probabilities furnished by approximate calculations needed verification. So it was not till after a detailed study of the ground in different parts of France that the administration of war made its final selection and assigned to the seventh regiment of engineers the task of preparing for the experiments and carrying them out. The Ravine of Combes, situated at about four miles from Avignon, upon the right bank of the Rhone, fulfilled all the conditions required. The preparatory work, which was executed under the direction of Commandant Delort, was long and difficult.

The sinking of the three mine wells was likewise very laborious. Their sites were marked at the summit of the slope of three neighboring hills, with an interval of a hundred yards between the first two wells and a slightly greater distance between the latter and the third. They were square in section and 26 feet in depth. At their lower part there was formed a large chamber capable of holding thirty cases, each containing 110 pounds of explosive.

The first two explosions took place on the same day (Saturday, October 10), between three and four o'clock in the afternoon. It was not till the evening of the preceding day that the 3,300 pounds of powder that were to fill one of the mine chambers and 2,750 pounds of melinite that were to fill the other were brought from the arsenal of Avignon to the ravine. Around each well, within a radius of 500 yards, had been placed a cordon of sentinels to prevent the curious from venturing too near.

At a signal given by a clarion, an electric current sent from the barracks ignited the powder in one of the mines. A strong detonation and a prolonged rumbling due to the fall of the disintegrated rocks was heard, and then a great column of smoke ascended and spread above the mine were crushed and thrown down, and the paths that gave access to the mine disappeared under the accumulated debris. A wide opening had been made in the rock, and upon the opposite side and at the bottom of the ravine were piled up masses of blocks that in some cases were 35 cubic feet in bulk. The road was buried under a layer of stones several feet in thickness, every trace of vegetation had disappeared, and the general aspect of the ravine was completely modified. The detonation was not heard at Avignon.

About an hour afterward the second explosion took place, that of the chamber charged with 2,750 pounds of melinite. It was more violent than the preceding the noise of it was distinctly heard at Avignon, and the earth was sensibly shaken at 500 yards from the mine.

The ravages caused by the melinite were appalling; less so, however, by reason of the materials displaced than by the extreme degree of comminution to which they had been reduced. Here there were no more blocks; nothing but a formidable heap of bits of rock, very few pieces reaching the size of the fist. What is a singular and unexplained fact is that upon the side of the ravine opposite that which directly suffered from the explosion the thick stratum of debris was arranged as if it had been formed by three jets directed in a parallel manner. Another point to be noted is that fissures and crevasses were exhibited for quite a wide extent around the mine. The rocks disturbed were in a state of unstable equilibrium, and the least shock sufficed to precipitate them into the ravine, where they broke up into innumerable fragments.

The experiment of October 13, that with the third mine, charged with 2,200 pounds of melinite, was no less interesting.

The consequence of the smaller charge was that the rocks were not so greatly comminuted, Nevertheless, it was easy to be seen that the debris around this mine was much more divided and more regular than that which strewed the ground in the vicinity of the powder mine.

This explosion offered a striking spectacle. At the moment of the detonation a sort of crater opened upon the hill, and, like a volcano, vomited up an enormous mass of debris, which, ascending like a wheat sheaf jet to a great height, amid an immense cloud of smoke fell back in a shower with the noise of thunder. A few seconds afterward the ravine exhibited the aspect of an indescribable chaos. The shrubs had been literally chopped in pieces by the volley of stones.

© 1896 SCIENTIFIC AMERICAN, INC.

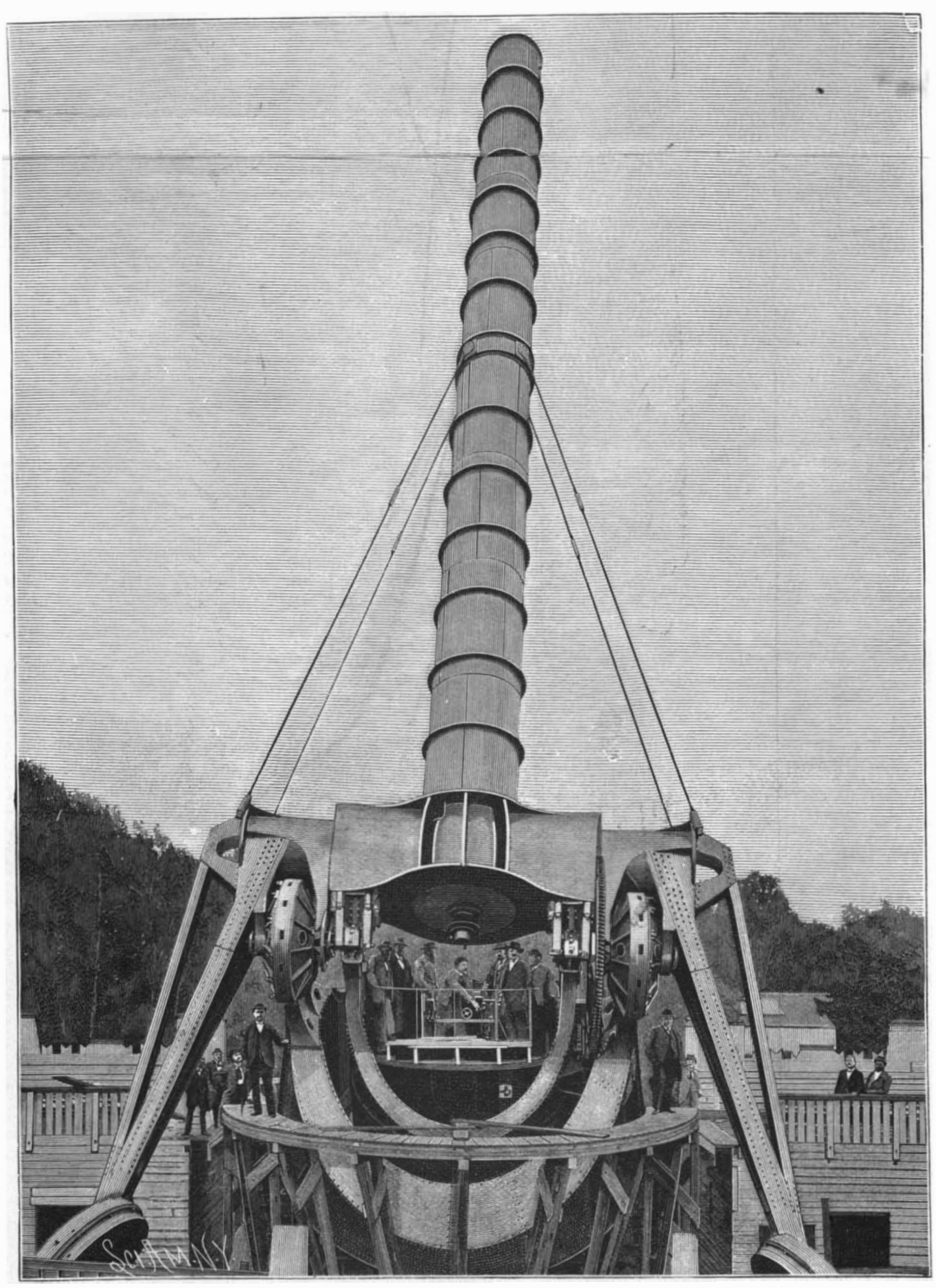
A TELESCOPE WITHOUT AN OBSERVATORY.

Among the attractions at the Berlin Industrial Exhibition of 1896 was the oddly mounted telescope shown in our engraving. It is customary to erect large telescopes within a movable dome, but in this case the instrument stands on an elevated platform in the open air, and the tube is protected by an extra cylindrical envelope or shell. A telescope of this type is almost invariably pivoted on an arm reaching from one side of the tube near its middle, whereas the two arms which constitute the "declination axis" of the great Berlin glass start from one end, close to the eyepiece. The trunnions which support a cannon are commonly placed nearer one end than the other; but the gun is evenly balanced nevertheless, because there is vastly more metal around its breech than around its muzzle. But at first glance the corresponding projections from this telescope tube seem to be so placed as to leave the weight, like the handle of a jug, all on one side. Careful scrutiny, however, reveals the fact that a massive bow or horseshoe, which might be mistaken for a part of the supporting structure, is really connected with the tube so as to form a counterpoise. The observer, therefore, sits motionless on the little platform formed by the prolongation of the polar axis, which platform is stationary, too. He does not change his elevation as in other observatories. Whether he aims the mighty tube at the zenith or the horizon, the eyepiece remains in the same spot, merely changing its angle. And the glass is so lightly hung, too, that he can shift it with his finger, although electrically operated machinery is usually employed instead. There is also a polar axis, lower down, and not shown in the picture.

The mounting is so arranged as to receive two objectives, of which one is designed for direct visual, the other for spectroscopic and photographic observations. For this reason the latter will be a double objective of short focal length, 20 to 23 feet, and large aperture, 43⅓ inches. It was exhibited in an unfinished condition, as the means for the purchase and polishing of the enormous lenses, which have been very successfully cast by Dr. Schott, could not be immediately raised. The rough disks of glass for the lenses of the telescope have been furnished by Dr. Schott and Genossen, of Jena, while the polishing has been executed by Messrs. C. A. Steinheil, of Munich. The mounting of the instrument was intrusted to the Berlin Maschinenbau Anstalt C. Hoppe, who was assisted by the firm of G. Meissner, Ber- lin, in the execution of the finer mechanical portions. The other objective, on the contrary, is completed, and has an aperture of 27½ inches and a focal length of 68 feet.

In focal length the Berlin glass makes another departure from usage. A length fourteen times the aperture used to be considered the standard proportion, from which, for various special reasons, there was often a departure. In very large telescopes, like that at the Lick Observatory, the focal length is about eighteen or nineteen times the diameter of the object glass.

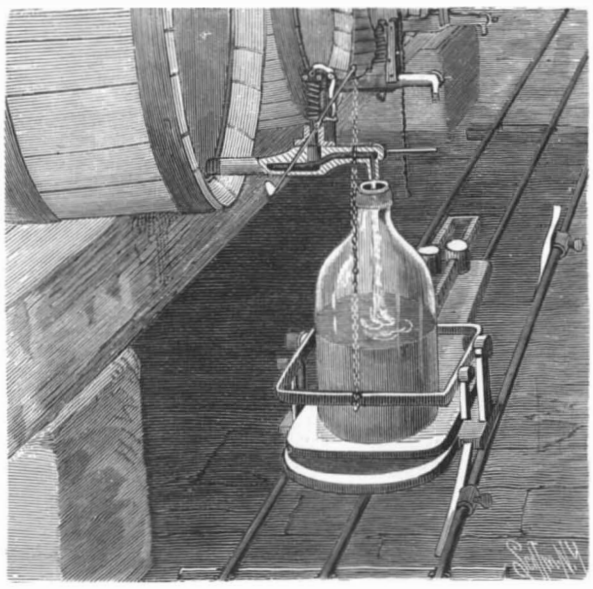
The new refractor at Berlin has a tube 68 feet long. This makes the proportion thirty to one. Among the advantages resulting from this remarkable focal length is an improvement in adaptability to photographic work. According to the Illustrirte Zeitung, an image of the sun 19½ centimeters (7·67 inches) in diameter is thus obtained on the sensitive plate, and this will stand a greater enlargement without losing distinctness than any solar photograph obtained elsewhere. From this fact and from the stress which is laid on the photographic collections in the libraries and lecture rooms of the new observatory, it seems probable that the instrument will be devoted largely to that class of work, though not to the exclusion of visual work. The telescope is the property of the Astronomical Observatory of Grunewald.



A TELESCOPE WITHOUT AN OBSERVATORY.

MEASURING LIQUIDS BY WEIGHT.

A simple device by means of which the flow of liquid will be automatically cut off when a definite weighed quantity has been delivered to a receiving vessel is shown in the accompanying illustration, and has been patented by George W. Curtis, of Long Grove, Iowa. As will be seen, the device is mounted on tracks or guideways extended along the front of a row of barrels,



CURTIS' LIQUID MEASURING DEVICE.

so that it may be easily moved from one barrel to another. The scale comprises a base plate and double scale beam extended from a rectangular frame portion fulcrumed on posts on the base plate, there being suspended from the frame a swinging platform on which the bottle or receiving vessel is placed. Outside the tracks is a rod on which are stops to fix the proper position of the scale when it is moved in front of a barrel, and the top of the scale platform is marked to facilitate centrally placing thereon jugs or bottles of different sizes. The faucet, which is shown partly in section in the engraving, has a vertically moving plug valve, whose stem extends upward through a bracket, the valve being downwardly pressed by a coiled spring. To lock the valve in open position, an angle lever is fulcrumed in bearings in the bracket supporting posts, the upper end of the lever being connected with the valve stem and its lower end being adapted to engage a hook latch. One end of the rock shaft on which is the hook latch is extended through the bearing post and carries a rod whose lower end is provided with a counterbalance weight, while its upper end is detachably connected by a chain with the frame portion of the scale. As an additional means of easily determining the proper position of the scale and neck of the bottle under the faucet, a guide rod may be mounted on a pivoted block near the outer end of the faucet, such rod being out of the way when turned horizontally, but, when turned vertically, engaging one side of the bottle neck. The bottle or jug, when placed on the scale platform, is balanced by a weight on one of the arms of the scale beam, and the proper weight for the desired quantity of liquid to be delivered is placed on the other arm of the scale beam. The chain connection is now made between the rectangular frame and the counterbalanced rod, and the valve is opened and held in open position by engaging the lower end of the angle lever with the hook latch, when the liquid may be left running, as its flow will be automatically cut off on the delivery of the proper quantity by the rocking of the scale beam, as the drawing down of the chain causes the release of the latch engaging the angle lever, and the coiled spring on the valve stem then closes the valve.

Ingenious Peruvian Potteries.

A long, slim neck is a distinguishing feature of much of the Peruvian pottery, and nearly every vessel is ornamented with a figure of some sort, having holes to represent eyes and other openings. These afford a passage for the air forced out by the liquid when poured into the vessel. By an ingenious contrivance the air in escaping produces a sound similar to the cry of the creature represented. Thus a utensil decorated with two monkeys embracing each other, on having water poured into or from it, would give a sound like the screeching of those animals. One decorated with a bird would emit birdlike notes, while a mountain cat on one jar would mew, snakes coiled around another would hiss.

The most curious that we have seen was the figure of an aged woman. When the jar was in use her sobs became audible, and tears trickled down her cheeks. The manufacturers seemed to have known all about atmospheric pressure. Dr. Le Plongeon had in his own collection a piece that demonstrated this. It represented a double headed bird. The vessel had to be filled through a hole in the bottom, and yet in turning it over not a drop would spill, but the liquid would readily flow out when the jar was simply inclined. The Peruvians were good portraitists, and many of the faces represented might pass for likenesses of people now living on the coast.—Alice D. Le Plongeon, in Appletons' Popular Science Monthly.

ACONCAGUA, the highest mountain on this hemisphere, is to be thoroughly explored by an expedition fitted out by Mr. E. A. Fitzgerald, the explorer of the New Zealand Alps, which recently left England for Buenos Ayres. A geologist, a surveyor, and a naturalist form part of the expedition, together with the Alpine guide, Mattias Zurbriggen. Mr. Fitzgerald's observations will be on the effect of the atmosphere of mountain heights on the human system, as he intends to scale Mount Everest, in India, the highest mountain in the world, if he succeeds in getting to the top of Aconcagua.

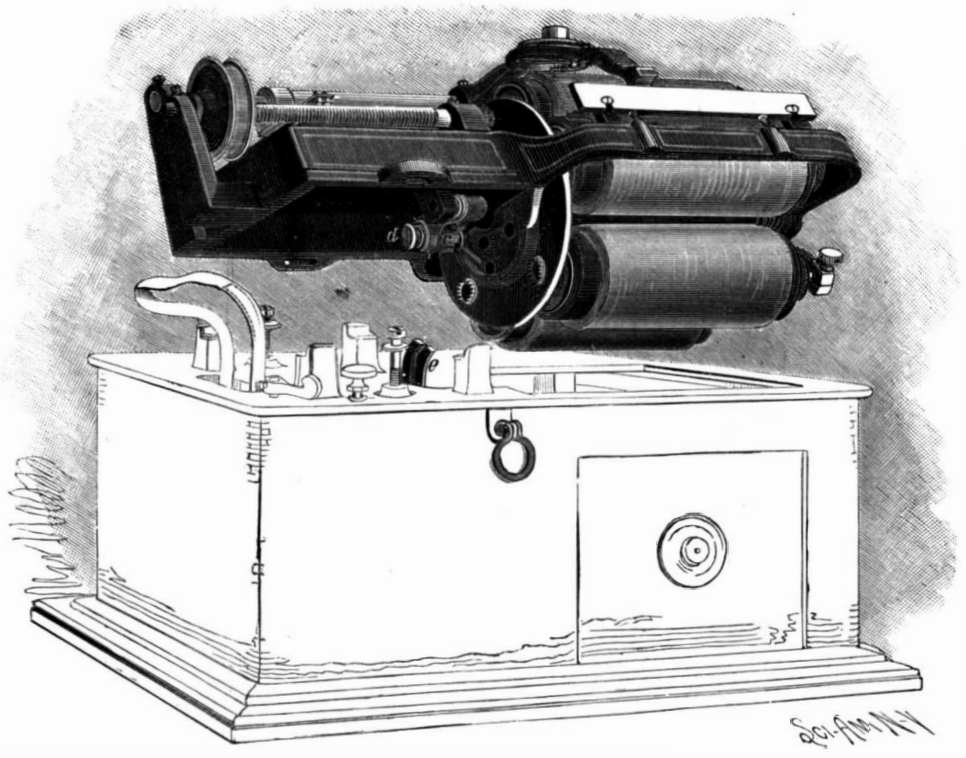
© 1896 SCIENTIFIC AMERICAN, INC.

MULTIPLEX PHONOGRAPH.

The phonograph, wonderful as it is, has been rendered more useful and more enjoyable to everybody, and at the same time more profitable to exhibitors, by an exceedingly simple improvement recently completed and patented by Mr. George W. Moore, of Atlanta, Ga.

This improved attachment increases the capacity of the machine fivefold, the construction being such that five cylinders are held in position for instant use. The improvement does not in any way affect the working parts of the machine.

The attachment has a frame holding a screw-threaded mandrel, which is driven by a belt connection with the spring motor contained in the case which forms the base of the machine. In the space usually occupied by the record cylinder is placed a reel in which are loosely journaled five mandrels, each having at the end adjoining the screw a half clutch and a conical cavity. The clutch fits its counterpart on the end of the screw, and the conical cavity receives the conical end of the screw. This construction insures the centering of the mandrels and at the same time lifts the clutch end of the mandrel in the reel, so that it has no bearing at that point. The reel is capable of sliding longitudinally to permit of shifting the cylinders, and it is pushed forward by a spring having sufficient strength to hold the clutch in engagement while the machine is working.



PHONOGRAPH WITH FIVE CYLINDERS.

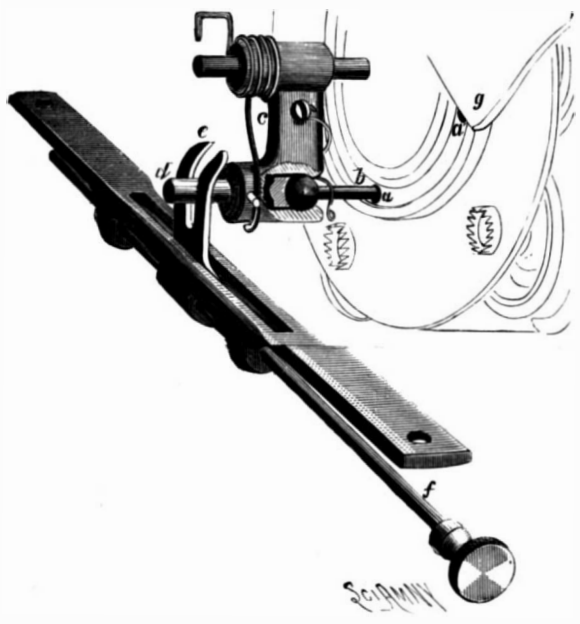
In the end of the reel are five equidistant cavities, a, for receiving the pawl, b, as shown in the detail view. This pawl consists of a short stud held in a ball joint in the swinging arm, c, with the free end of the pawl pressed against the end of the reel by a spring. The arm, c, swings on a pivot concentric with the reel, and is provided with a spring for carrying it back against a stop at the point where the pawl enters one of the cavities, a, in the end of the reel. A stud, d, projects from the free end of the arm, c, in line with the axis of the pawl, b. This stud serves the double purpose of holding the ball end of the pawl in its cavity and of receiving the fork, e, by which the arm is swung when it is desired to shift the cylinders. The fork, e, is attached to a rod, f, which projects through the front of the phonograph base. After having moved the reel carrying the record cylinders one-fifth of a revolution, the arm, c, being carried back by its spring, the pawl, b, drops into one of the cavities, a, and when it is desired to shift the record cylinders, a forward movement of the rod, f, causes the arm, c, to swing, thereby swinging the pawl, causing it to shift from an oblique position, bringing it parallel with the axis of the arm, c, thereby increasing the distance between the reel and the arm, disengaging the clutch connecting the mandrel with the screw, and then moving forward the reel one-fifth of a revolution until the pawl, b, strikes the stop, g. When the arm, c, is returned to its original position, the spring on the reel carrying the record cylinders moves the reel forward, bringing the clutch of the next record cylinder in order in line with the screw. The continued movement of the arm withdraws the pawl from the cavity in the reel and carries the pawl back ready to be engaged with the next cavity in the reel.

This simple and ingenious contrivance enables the user of the phonograph to shift from one record cylinder to another even while the phonograph is in operation, the reproducing apparatus being adjusted to admit of this movement. The engagement of the pawl with the stop after the movement of the reel prevents the throwing forward of the reel by its own momentum.

This attachment greatly increases the capacity of the phonograph and renders it more valuable for business purposes. It has been shown by months of constant use that a phonograph with this attachment will net the exhibitor much larger profits than the single machines. It is obvious that the number of cylinders need not be limited to five, as the principle involved can be as readily adapted to ten or twenty as five.

As a "nickel in the slot" machine, reproducing the songs and recitations of celebrated artists, and the latest and most popular airs of musical composition, the phonograph has achieved great fame and popularity. It has been exhibited all over the globe, winning praises everywhere.

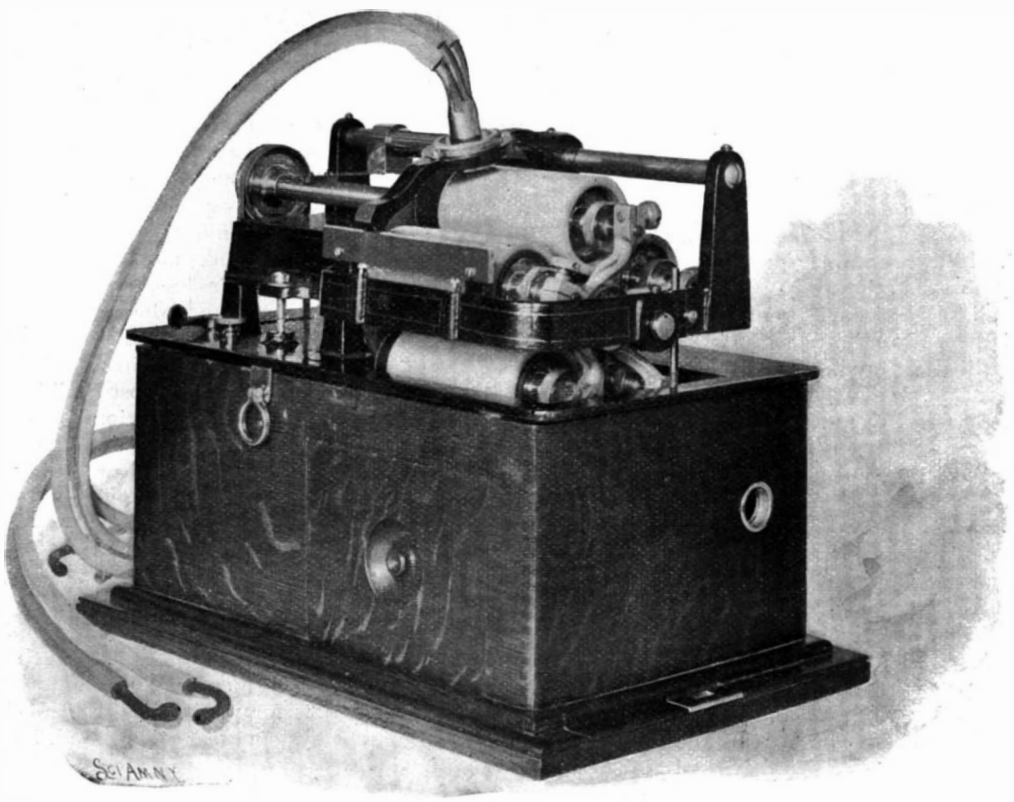
If the capacity of the machine had been larger, its usefulness would have been greater, and the profit arising from its exhibition would have been proportionately large.



THE SHIFTING MECHANISM.

To this idea is due the multiplex attachment. Having five cylinders where the old phonograph had only one, the multiplex necessarily increases the resources and commercial value of the machine in proportion to the number of additional cylinders, while occupying the space of only one machine.

This useful improvement in phonographs is controlled by the Multiplex Phonograph Company, 1395 Broadway, New York.



THE MULTIPLE PHONOGRAPH.

Victorian Wars.

The Army and Navy Gazette calls attention to a remarkable feature of the Queen's reign, the enormous number of wars, "little and big," that have marked its progress. Scarcely a twelvemonth of this period has passed, indeed, without finding England at war in some part of the world. Here is a list of the principal campaigns and expeditions: Afghan war, 1838-40; first China war, 1841; Sikh war, 1845-46; Kaffir war, 1846; second war with China, second Afghan war, 1849; second Sikh war, 1848-49; Burmese war, 1850; second Kaffir war, 1851-52; second Burmese war, 1852-53; Crimea, 1854; third war with China, 1856-58; Indian mutiny, 1857; Maori war, 1860-61; more wars with China, 1860 and 1862; second Maori war, 1863-66; Ashanti war, 1864; war in Bhootan, 1864; Abyssinian war, 1867-68; war with the Bazotees, 1868; third Maori war, 1868-69; war with Looshais, 1871; second Ashanti war, 1873-74; third Kaffir war, 1877; Zulu war, 1878-79; third Afghan war, 1878-80; war in Basutoland, 1879-81; Transvaal war, 1879-81; Egyptian war, 1882; Soudan, 1884-85-89; third Burma war, 1885-92; Zanzibar, 1890; India, 1890; Matabele wars, 1894 and 1896; Chitral campaign, 1895; third Ashanti campaign, 1896; second Soudan campaign, 1896. The same paper gives an account of hardships during the present Soudan campaign.

The Second Brigade was ordered to march from Suarda to Sadin Fanti, twenty-one miles distant across the desert, instead of following the river. The heat was intense; the men were in heavy marching order, water was short. There were twenty-nine cases of sunstroke, of which two were instantly fatal. Numbers fell out and soldiers were in the most exhausted condition.

The First Brigade fared still worse. They were ordered to set out one afternoon for a march of thirty-seven miles across the desert, each man carrying his rifle, his kit, two days' rations and a hundred rounds. The storm that was threatening when they left came upon them before they reached the first watering place. Nearly three hundred men fell out, of whom nine died, and before they arrived at Sadin Fanti one thousand seven hundred men had fallen out, and of one battalion of seven hundred men only sixty marched into their quarters.

Rain Experiments.

L. Errera describes in Terre et Ciel, says Engineering, a very simple manner of producing a rain, not of water, but of alcohol, and the winds which accompany its formation. That he is by no means the first in the field does not make his experiment less interesting. A glass cylinder about 8 inches high and 4 inches in diameter is half filled with alcohol of 92 per cent. The cylinder is covered with an ordinary china saucer and slowly heated in a water bath, so that the whole becomes warm without the alcohol beginning to boil. The vessel is then taken out of the bath and placed on a table. Vapors soon begin to condense on the saucer, clouds form, and tiny regular drops fall down in vertical lines into the alcohol. The drops have an average diameter of 40 or 50 millionths of a millimeter, but they vary in size. The rain continues for half an hour. The upper part soon clears, and the condensation takes place some distance below the saucer; thus we have the ocean, the clouds above, and the serene sky higher up still. If, after heating the vessel, the hot saucer is suddenly replaced by a cold one, storms can be observed. As one side of the cylinder will not rarely be a little colder than the other, ascending currents can often be noticed on the one side, descending on the other. If the warm part is cooled, the currents change direction. The arrangement lends itself to other experiments.

TRIESTE recently had a rainfall of $6\frac{1}{16}$ inches in 12 hours.

© 1896 SCIENTIFIC AMERICAN, INC.

PATENTS AS INVESTMENTS.*

BY ALBERT SCHEIBLE.

Our greatness as a manufacturing nation depends so largely on the patent system, which has been in force for the last sixty years, that the question of the value of patents must be of general interest. Especially is it of importance to workers in the electrical field, since the commercial side of our line shows its dependence on patents at every step. Still, among electrical people as among others, we find quite a range of opinion in regard to the value of patents (the term being used to denote the control of patented inventions). On the one hand we find lists of patents scheduled as heavy assets by our prominent electrical concerns, while on the other hand we hear the grumbling about the worthlessness of patents issued by the United States government and the folly of spending money in obtaining them. Of course a patent in itself is merely a formal recognition of the inventor's originality and of his willingness to let the public have the free knowledge and use of his invention after the expiration of the seventeen years during which he can defend himself against pirates. The patent in itself does not confer any value. It is merely offered in order that the inventor will disclose what is of value. So in treating of patents as investments, we must consider the value of the patented invention as compared with the unpatented and, hence, unmonopolized one.

If we are ourselves inclined to originate new and useful ideas, we want to know if it will pay to invest money in patents as a first step in controlling their exploitation. Then, as engineers, we have the general public looking to us for guidance. So the question becomes still more important. And since every dollar improperly spent in connection with electrical work takes at least one dollar out of the reach of those who need it for promoting legitimate undertakings, hence we should all be more or less interested in checking any rash investments. Some years ago ex-Commissioner of Patents Thatcher made the claim that over half of the patents issued by our government are remunerative; but I believe he did not state how well the paying ones were averaging nor what was lacking with the balance that would keep them from bringing proper returns. Perhaps we can best get at this point by studying the features which ought to make an invention worthy of commercial success and hence of patent protection. For while there may be no general rule of commercial success or failure which we can apply to all patented inventions, is it not plausible that those will fare best which are most worthy of success? Here, for [illegible] not be noticeable in a given invention:

(1) Decided originality; not merely enough to make it patentable, but sufficient to avoid the evading of such a patent by equally simple and effective devices.

(2) Utility to the extent of filling a decided want more than a mere local usefulness, so as to command a widespread sale under varying conditions.

(3) Exploitability at the hands of the inventor or of those with whom he is in contact.

Then as to the patent itself, there is point 4. The patent should strongly cover the invention.

These four points strike me as the ones which would usually determine the prospects of success or failure for any patent from an investment standpoint. And are they not points whose importance ought to be self-evident? It takes originality in an invention to entitle it to a patent; but a very simple rearranging of parts with an extra hook or lever may be enough for this. And if the device is easily gotten up, why should it be hard for a competitor to get up an equally effective one which would evade the patent? Only the decidedly original patents are usually hard to evade, and therefore valuable as protectors. Then we need utility to a large degree in order to find any considerable market for the patented article. The man who patented the shadow sign device for use in street railway tunnels no doubt devised an article which could prove useful in the three Chicago tunnels, but where else would he find a market for it? Then as to the strength and breadth of the patent when procured. It takes an able lawyer to weigh every word and every phrase in the application so that his client may get all to which he is entitled, and either the inventor or his attorney or both must have a good knowledge of the allied art and a keen insight into the future of the invention. It always lessens my opinion of a patent when I hear the inventor brag about writing his own claims and specifications; for not only do two heads think more than one, but it takes the skilled attorney to tell just what to put in and what to leave out in order that the case may be put most clearly before the examiner. And of course there must be some prospects of exploiting the invention, else of what use is the patent?

Briefly, you need only to ask yourself four questions: Is the invention decidedly original, does it fill a widespread want, will the proposed patent properly cover it and is the inventor in position to profit by the governmental protection implied in the patent? If the invention meets these four tests, it ought to be worthy of success, and hence a good investment; but every shortcoming on any of these four points will count against it. And if a given idea will not stand the test of these four simple questions, why spend a single dollar toward patenting it? Our government issues patents because it wants the public to be benefited by new devices needed for its progress and welfare, but that does not mean that every new idea is so needed by the public. Indeed, the average thinker will strike a great many ideas which fill no decided want. He can well afford to shelve most of them if he will only learn to save the one or two that are really worth exploiting, for it is only by persistent study and experiment that most of the really valuable patented inventions have been produced. The first rough pencil sketch may be quickly made the basis of a patent, but rarely of as broad and valuable a patent as it would if based on farther thought and trial. Indeed, the hasty patent often prevents the getting of a broader and not readily evaded one later on; so it is usually both wiser and cheaper to do some developing before drawing up the application. The law allowing the public use of an invention for two years before an application is filed seems to have been carefully timed; for my own experience has shown it to take about two years for an invention to mature from the pencil sketch to the working model, from this to the marketable form and thence to the practically successful and patentworthy form. Sometimes a very few months or weeks will prove an idea to be of little commercial value; then, so much the better, for the patent money saved is just so much money earned and ready for a worthier device. If you want a practical illustration, look at some of the strongest and most feared patents—some, for instance, of Brush or Elihu Thomson. See what an insight they show into both the prior art and the field for the invention; also how well they cover those modifications which only suggest themselves to one who has been hunting for possible weak points in his own proposed patent.

It is the speculative type of patents that leads to a large share of the unremunerative ones, and unfortunately the average inventor is surrounded by influences that tend to encourage rather than suppress the speculative tendency. Our newspapers tell about the fortunes made out of patents, and, as most men imagine that the big profits can only be made in some one else's business, they jump at the idea of "inventing" along a line where every turn brings up something new to them (though perhaps old and time worn to those proficient in that particular line). So the man of ideas speculates first as to the novelty of his contrivance, then as to the great demand which will spring up for it, and perhaps even as to the rate at which manufacturers will tumble over each other to get control of his invention. A conscientious attorney would be apt to disturb his alluring dream. So he seeks the other and more eager kind—the ones that offer prizes to the most prolific originator of patentable (even if not patentworthy) ideas. These urge him to make haste and file his application before some one overtakes him, and if he hesitates as to the prospects of returns, they clinch his dollars with that money-wasting phrase: "No patent, no pay." They do not tell him to first consult parties commercially interested in devices similar to his invention to learn if the calls for it would be by the thousand or only by the dozen. Nor is he allowed to think what he can do with the device after he gets it patented, but every effort is directed to interesting him in quickly getting some sort of a patent. He gets it and soon begins to wonder what he has got. Later on we can hear the grumbling about our inefficient patent system, about frauds which must have happened in order to spoil the inventor's chances and about patents being "worth the full price of wall paper."

It is easy to blame the Patent Office, but is it not the public that needs the educating? Look at the class of reading matter which the public accepts as wholesome. Send for one of those "inventor's manuals" published for free distribution by ever so many wholesale patent enticers, and what advice do you find in it? Let me quote from a few of these pamphlets: "Don't think you can't invent, but keep on thinking and you will invent something." "Nothing yields greater profits than patents." "Patents appear to be the poor man's only hope of escaping the slave's fetters." "Lose no time—the man who has ever conceived an invention and has failed to patent it until some one else has anticipated him has lost the opportunity of a lifetime to win a fortune with the least possible expenditure of time and labor." In other words, everybody that does any thinking should invent early and often and should rush his applications into the Patent Office (through this or that attorney) before the idea is cold! Just as if any quantity of hurriedly concocted ideas (even if patentable) were more to be desired than a single carefully thought out and really patentworthy invention. Such a patentee himself can only speculate as to what he has produced and what returns he may get for it, and is it for promoting such speculations that our patent system was established? If not, then why should we criticise the system for the results of this abuse?

And where shall we start to remedy some of this misdirection of energy, time and money? Right among ourselves, for it is the electrical engineer of to-day who can and who ought to counteract the rashness which is commonly thought to be proper for any one who originates a new contrivance or who spends money on it. The unwritten ethics of our profession demand that we should promote the legitimate and suppress the speculative in patents as in every other phase of electrical work. Then we owe it to our splendid patent system that we should insist on its being used only in the way which will be most helpful to general progress. And to whom can the isolated inventor look for guidance, if not to us who have (or hope some day to have) a broad survey of the whole field of electrical engineering? Whatever we can do to turn his efforts from the rushing after many and narrow patents to the working out of a single and much needed one will react for the benefit of our profession. Should not we be prepared both to judge of new devices ourselves and to guide the over-enthusiastic inventor so that he may see his own contrivance in a broader light? If four or five plain hints will help him, perhaps these will do:

(1) First learn the state of the art, so as to see how much real novelty there is in the invention. Only the man who is well informed on what is old can know that a certain idea is really new, and we all need to take full advantage of those factors which keep us abreast of the times—like our electrical papers and our technical society meetings.

(2) Consult parties commercially interested in the particular line, so as to learn whether or not the invention is worth patenting. Study the tendencies of the times to see if they are toward a more widespread or a more limited use of the invention.

(3) Test the probable scope of the patent for yourself by trying to devise other means for producing the same result. Can you readily invent a way of getting around your proposed patent?

(4) Consider what you can do with the patent after you get it. Can you properly exploit it yourself, or have you reason to believe that others can and will do so for you?

(5) Find out something about your proposed attorney. Has he a broad knowledge of the field, can he word clear and concisely broad patents, will he advise in favor of his client's interest or only for the benefit of his own pocketbook?

Given such hints to turn the latent energy of our inventors to thoroughness in their work and to a businesslike estimate of its value; given also an undercurrent of protest against the speculation that sometimes masks in patents, and given a frank admission that the trouble with our patent system lies chiefly in its abuse at the hand of misguided inventors and investors—then may we not look for a finer type of patent applications and a higher estimate of the value of patents?

* A paper read before the Chicago Electrical Association, October 16.

Salted Fruits.

The preservation of lemons, oranges and citrons destined for export from Italy, and not for immediate consumption in their integrity, but which are nevertheless valuable articles of export on account of the various uses to which their juices may be applied, is a very important object in those cases where the shipment and conveyance to distant parts would be impossible, either on account of the distance to be traversed, or on account of the unsoundness of the fruit, or from both causes combined. It is customary in Italy to slice and steep the fruit in large casks filled with salt and brine. The bitter oranges, lemons or citrons are then first of all examined, and Vice-consul Pignatorre, of Messina, says that, although not subjected to the same crucial tests which would be required were the fruit to be shipped entire or their essence properties considered, still they must not be internally diseased and must be of average juiciness to be exportable and marketable. They are then soaked in salt water for a few days, the time varying between three and eight days, according to the more or less maturity of the fruit. On the arrival of the fruit it is repeatedly washed in fresh water until the salt contained has been completely dissolved and carried off. It is, however, unquestionable that whatever the preserving qualities of the salt, the process involves an almost total loss of the essential oil of the peel and a deterioration of the juice, and should only be resorted to in extreme cases, when the fruit would not be otherwise profitably used at home or shipped abroad.—Journal of the Society of Arts.

German Trade.

The imports from the United States into Germany increased from $114,000,000 in 1893 to $120,000,000 in 1895. The imports from Great Britain into Germany decreased in the same period from $160,000,000 to $130,000,000, and those from the Austro-Hungarian monarchy from $143,000,000 to $126,000,000. Russia, on the other hand, increased her imports from $86,000,000 to $140,000,000, thereby taking the first place among countries importing into Germany. The increase was mainly in agricultural products.—Uhland's Wochenschrift.

© 1896 SCIENTIFIC AMERICAN, INC.

Recent Patent and Trade Mark Decisions.

Dueber Watch Case Manufacturing Company v. Robbins (U. S. C. C. A., 6th Cir.), 75 Fed., 17.

Danial of Validity by Licensee.—While a licensee of a patent cannot deny its validity, this rule applies only while the license is in force; after it has expired the validity of the patent may be disputed in any suit not on the license contract.

Extensive Use as Evidence of Invention.—Extensive use is to be considered as evidence of invention only in cases otherwise doubtful; and it loses its force as evidence where the use can be attributed to something else than mere novelty.

Stem Winding Watches.—The Colby patent, No. 287,001, of which the essential feature is the spring latch attachment of the stem with a key, whereby the latter is free to rotate but is prevented from being moved longitudinally except by special effort, is void, because it does not amount to invention in view of the prior art.

Consolidated Store Service Company v. Whipple (U. S. C. C., Mass.), 75 Fed., 27.

Store Service Apparatus.—The Osgood patent, No. 293,192, has been held valid as to claim 2, and No. 357,851, valid as to claim 1.

Holyoke Machine Company v. Jolly (U. S. C. C., Mass.), 75 Fed., 190.

Water Wheels.—The McCormick patent, No. 265,689, providing the acting face of water wheel buckets with corrugations to better retain the water therein and in constructing the corrugations that substantially equal amounts of water will pass through them, is void.

Leatheroid Manufacturing Company v. Cummings (U. S. C. C., Mass.), 75 Fed., 271.

Boxes.—The Andrews patent, No. 329,875, for a box of thin flexible material reinforced at its upper edge by a band, and protected at the corners by metal corner pieces, is void, as being a mere aggregation of old devices.

Boston Lasting Machine Company v. Woodward (U. S. C. C., Mass.), 75 Fed., 271.

Lasting and Fastening Machine.—The Woodward patent, No. 248,544, is not infringed by a machine in which the tack driving machine is actuated, not by the pressure of the work but by the pressure of a rod connected with a treadle, so that the desired result of driving a tack at the proper time, without the use of the operator's hand, is attained by a different method.

A. B. Dick Company v. Henry (U. S. C. C., N. Y.), 75 Fed., 388.

Mere Carrying Forward Prior Art.—The rule that a mere carrying forward or more extended application of an original invention so as to obtain higher finish, greater beauty, and increased commercial value is not a patentable invention, is not applicable where the improvement, by reason of its adaptation to new uses and hitherto undeveloped possibilities, performs new functions and accomplishes new results.

Proof of Title.—The technical objection that title to the patent has not been proved will not prevent a disposition of the case on its merits when the question is not raised until nearly the close of the final hearing.

Stencil Sheets.—The Broderick patent, No. 377,706, for stencil sheets consisting of yoshino or other porous paper coated with wax so soft that the impression made thereon does not materially disintegrate the fibers, but presses the wax out of the sheet on the form of the impressing matter, is valid.

Bennett v. Schooley (U. S. C. C., Pa.), 75 Fed., 392.

Meaning of "Detachable" in Claims.—The words "detachable clip," as used in the claims of a patent for a railway torpedo, mean a removable clip, that is one which is connected with but not positively attached to the torpedo, as by riveting or soldering.

Railway Torpedoes.—The Beckwith patent, No. 409,902, has been held valid.

New York Paper Bag Machine Manufacturing Company v. Western Paper Bag Company (U. S. C. C., Ill.), 75 Fed., 395.

Preliminary Injunction.—A preliminary injunction based on claim 9 of the patent to Lienback, Wolle and Brunner, No. 242,661, for a paper bag machine, was refused, because it was not certain that the hinged folding plates of the claim 9, with the associated mechanism as described, were to any degree practically operative for making paper bags.

Western Mineral Wool and Insulating Fiber Company v. Globe Mineral Wool Company (U. S. C. C., W. Va.), 75 Fed., 400.

Process for Making Mineral Wool.—The Rockwell patents, No. 447,360 and No. 452,733, for making mineral wool by remelting hardened slag or scoria from smelting furnaces with lime and silica or silica and limebearing stone, and blowing the same into mineral wool, has been held valid.

Bemis Car Box Company v. Boston & R. Electric Railway Company (U. S. C. C., Mass.), 75 Fed., 403.

Car Axle Box.—The Bemis patent, No. 239,702, has been held valid, and infringed by a device made in substantial accordance with the Brill patent, No. 418,439, for a dust shield for car axle boxes, as it merely adds an abutment, which is a mere change of form.

Car Wheel.—The Bemis patent, No. 333,072, which consists substantially in having the annular flange of the wheel detachably secured to the wheel instead of cast integral with it, is not infringed by a wheel where it is possible to remove the flange and substitute another, but the change would amount substantially to a reconstruction.

Heap v. Fremont and Suffolk Mills (U. S. C. C., Mass.), 75 Fed., 406.

Cloth Napping Machine.—The Grosslin patent, No. 377,151, if valid, is limited by the prior art to the specific methods used to produce the main result which is the function of the machine.

Mullen v. King Drill Company (U. S. C. C., Ind.), 75 Fed., 407.

Grain Drills.—The Mullen patent, No. 355,462, for grain drills designed for the special purpose of drilling seed between rows of standing corn, has been held valid.

Dunbar v. Eastern Elevating Company (U. S. C. C., N. Y.), 75 Fed., 567.

Grain Elevators.—The Dunbar reissue, No. 10,521, for a grain elevator wherein the elevator tower may be quickly and easily moved so as to reach the different hatches of a vessel and with two elevator legs that may be simultaneously moved so as to take grain from two hatches at once, has been held valid.

Reissue for Attorney's Mistake.—Where a patent solicitor consents to the striking out of a certain claim upon the citation of a patent which he thought was prior in date of invention, but which was afterward shown to be of a later date, his mistake is such that the reissue may be had, if seasonably applied for, wherein the parts stricken out are restored.

Infringement by Modifying the Device.—Where one uses the substance and essentials of a patented combination, he cannot escape infringement by varying the non-essential details.

Thompson v. Jennings (U. S. C. C. A., 2d Cir.), 75 Fed., 572.

Saws.—The Thompson patent, No. 328,019, for a metal saw with a tough pliable solid blade highly tempered as to its teeth only, to prevent the breaking of the blade by sudden twisting, has been held valid.

American Soda Fountain Company v. Zwietusch (U. S. C. C., Wisc.), 75 Fed., 573.

Enlargement of Claims by Reissue.—Where the specification and claims of a patent for soda fountains clearly referred to the style of apparatus for vertical sirup cans and the claims mentioned only vertical cans, a subsequent reissue which included both vertical and horizontal cans was void for improper enlargement of the claims, especially where the same were thereby made to cover a new device invented and placed upon the market in the meantime by another, and the testimony of the solicitor that in using the word "vertical" in the original patent he had in mind merely the form of apparatus in which the cans were inserted from above as distinguished from that in which they were inserted from in front, was not a sufficient showing of inadvertence, accident or mistake.

Lapse of Time in Reissuing a Patent.—Lapse of time is only one of the elements to be considered in an application for a reissue, and the fact that an application was made less than ten months after the issue of the original will not warrant the insertion of claims deliberately omitted in the original, especially where adverse rights intervened.

Soda Water Apparatus.—The Park reissue patent, No. 11,313, is void, for unwarranted enlargement of the claims.

English Motor Carriage Race.

An immense crowd assembled near the Hotel Metropole, London, November 14, 1896, to witness the departure of the motor carriages for their race to Brighton, 47 miles. The occasion of the race was the going into effect of the new law which opens the highways to the use of the motor carriages and doing away with the antiquated laws and restrictions which have hitherto obtained. It is a curious fact that under the old law self-propelled vehicles were not allowed to go faster than six miles an hour and have to be preceded by a horseman waving a red flag.

Nearly fifty carriages started in the race, including many of those which obtained celebrity in the now famous Paris-Marseilles races. The spectators were very enthusiastic and the roads were so blocked that the police had considerable difficulty in clearing the way at times. It is a great satisfaction to know that the race was won by the American Duryea motor wagon, which was the first to arrive at Brighton. The distance was covered in four hours.

A NEW lamp shade invented by A. Von Kozlowski is made hollow, to be filled with a suitable liquid, such as a very dilute solution of sulphate of copper with a slight addition of ammonia. This shade absorbs the heat and reflects the light, at the same time giving it an agreeable color.—Wiener Gewerbe Zeitung.

Science Notes.

Prof. Virchow's birthday occurred on November 13 and was fittingly celebrated in Berlin. He is now seventy-five years old. He took his medical degree in 1843.

In our issue for November 7 we illustrated an explosive nut. A reader of the SCIENTIFIC AMERICAN tells us that the nuts can be kept from exploding by filling with melted lead, the lead passing into all the chambers. He also tells us that in Cuba the nuts are loaded with lead and are afterward filled with dynamite and left by the insurgents within reach of the Spanish army. Details as to how they are detonated are lacking, however.

We have learned from credible sources, says the Popular Science News, that St. Von Niementowski has prepared a paper giving an account of carboxethylorthoamidoparatoluylamide, of nitrometamethylorthouramidobenzoyl, of amidometamethylorthouramidobenzoyl, of dinitrometamethylorthouramidobenzoyl, of diamidometamethylorthouramidobenzoyl, and of the diacetyl derivative of diamidometamethylorthouramidobenzol.

A correspondent says: "Noting your article on page 286, October 10, about salt water for catarrh colds, I wish to 'offer an amendment.' Take equal quantities of salt and sugar, say half a teaspoonful of each to a glass of warm water, and use as directed in above article. It will be found that the addition of the sugar takes away the stinging sensation produced by the salt alone or even by plain warm water. Have used it for years with great satisfaction."

Prof. Patrick and Dr. Gilbert, of the University of Iowa, have recently tried the experiment, which is described in the Psychological Review, of keeping three observers awake for ninety consecutive hours. The observers did not suffer, although dogs die if kept awake four or five days. The physical and mental condition of the observers were noted during and after the enforced insomnia, and the results are of great scientific and practical interest.

Dr. Nansen will receive a special gold medal from the Royal Geographical Society when he goes to London, as he has already received the society's highest award, the gold medal, for his explorations in Greenland. Dr. Nansen has received $50,000 from the publishers for his coming book. This statement was sworn to in a suit they brought recently to prevent the Daily Chronicle from printing a long account of his explorations written by him. Dr. Nansen's work on his expedition to the North Pole will be published in the English language by Messrs. Archibald Constable & Co.

Auguste Trecul, the distinguished botanist, died in his seventy-sixth year, after a long retirement from active scientific work, says the Garden and Forest. His principal papers relate to the development and relations of the vascular system in plants and to the mode of growth of stems and roots. He is best known to Americans, perhaps, by his travels and botanical discoveries in the States west of the Mississippi River, especially in Texas, where he was sent in 1848 by the French government to collect material for the Paris Museum and to study the textile plants used by the Indians of the plains, and where he remained during three years. The beautiful arborescent yucca of the lower Rio Grande valley, first introduced by him into European gardens, bears his name.

J. Agafonoff, having studied about a hundred and thirty crystalline substances, finds that matter in this condition does not as a rule absorb ultra-violet rays in a marked degree. Chromates absorb all the ultra-violet, violet and blue rays, the pressure of chromium appearing generally to increase absorption. Nitrates absorb more than sulphates and organic bodies are extremely absorbent. The strong absorption of the latter seems to indicate that chemical molecules tend to absorb ultra-violet rays more abundantly in proportion as they are more complicated. Except chromates, substances which have a strong absorption crystallize badly, while those that crystallize well are in general transparent to the ultra-violet rays, as, for example, alums, quartz, fluor spar, sulphates, tartrates, citric acid, and erythrite.—Comp. Rend.

The important matter of the sight of school children has been receiving attention in Baltimore. The eyes of 53,067 pupils were examined, and the percentage of normal vision was found to be: first grade, 35; second, 41; third, 47; fourth, 49; fifth, 48; sixth, 48; seventh, 54; and eighth, 56 per cent. In the cases of 9,051 pupils the eyesight was found to be so defective as to make any schoolwork unsafe. An unexpected and unexplained result of the examination was the showing of a steady decrease in defective eyesight from the second to the eighth grade, the second showing 30 per cent less than the first, the third 42 per cent less than the second, the fourth 53 per cent less than the third, the fifth 63 per cent less than the fourth, the sixth 75 per cent less than the fifth, the seventh 85 per cent less than the sixth, and the eighth 91 per cent less than the seventh. The eyesigh of some pupils in the higher grades had been improved by their wearing glasses, and some teachers found that "stupid" children were making better students after an examination of their eyesight.

© 1896 SCIENTIFIC AMERICAN, INC.

THE NEW TEN INCH WIRE WOUND, SEGMENTAL GUN FOR THE UNITED STATES ARMY.

The Ordnance Department has taken in hand the construction for experimental purposes of an altogether new type of gun, which is likely to show an efficiency far in advance of the hooped gun which is the standard type for the United States army and navy to-day. The new weapon, of 10 inch caliber and 30 tons weight, will be known as a Brown segmental, wire-wound gun, and will be the second of its type to be built; the first, a 5 inch gun, having been built four years ago by the inventor, Mr. J. H. Brown, and tested by the government at the United States proving grounds, Sandy Hook, in December, 1893, and again in May, 1896. The tests consisted of 200 rounds, fired with both brown and smokeless powder, when the gun was subjected to excessive powder pressures, the maximum reaching 65,600 pounds to the square inch, and developed the high muzzle velocity of 3,235 feet [illegible] out showing any signs of failure.

Although the principles upon which the wire-wound gun is constructed are thoroughly scientific, they are simple and easily understood. If the modern gun were made in one piece, as were the old cast iron guns, the enormous pressure of the powder gases would stretch the metal lying nearest the bore of the gun beyond its elastic limit before the overlying metal nearer the circumference could come into play and assist in taking the strain.

To correct this fault guns are built up in a series of overlying cylindrical rings, each ring being shrunk on over the others, with the result that the innermost tube is thrown into a state of initial compression. It is evident that upon firing such a gun the shock of discharge will be instantly felt and resisted by every one of the cylinders or "hoops," as they are called, and every particle of metal, from the bore to the circumference of the gun, will be doing useful work. The strength of a built-up gun will depend upon the amount of initial compression and tension which the inner tube and the outer layers can respectively be made to carry, and this in turn depends, of course, on the elastic strength of the metal employed. Many years ago it occurred to a Mr. Longridge, in England, that if, instead of shrinking on hoops, a high grade of steel wire were wound onto the inner core of the gun at a high tension, a much higher compression of the inner tube could be obtained and greater powder pressures and velocities would be possible. He built an experimental gun which verified his theories, but failed because sufficient provision had not been made for longitudinal strength. The system was ultimately taken up by Mr. Armstrong in England, who overcame the difficulties of longitudinal weakness and produced a wire-wound gun, which has been adopted as the standard weapon for the whole British navy.

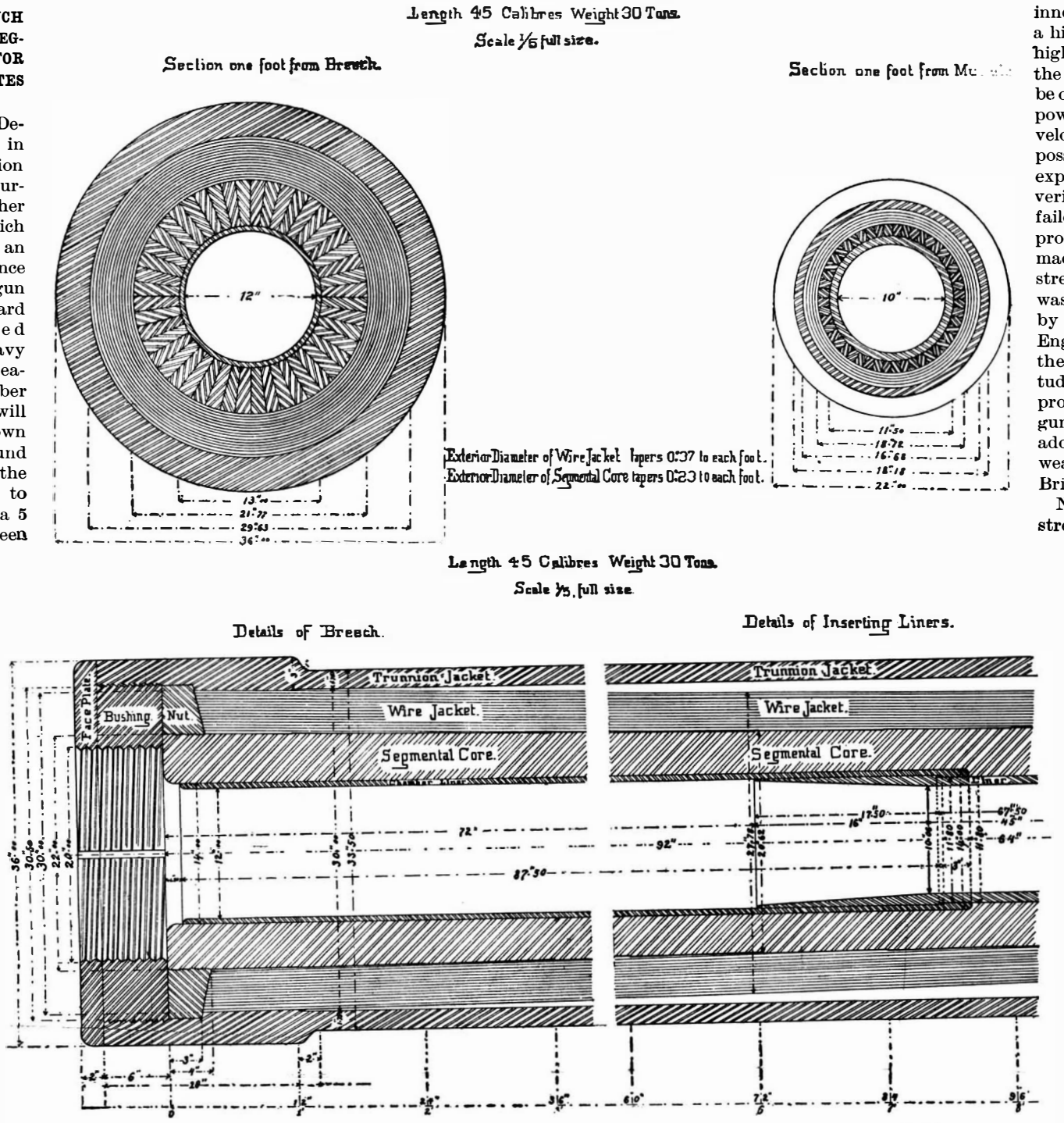
Now, the limit of strength of the ordinary wire-wound gun will be the elastic strength of the inner core of the gun (for it is evident that the metal must not be compressed beyond its elastic limit), and the elastic limit will be dependent upon the possibilities of manufacture.

Mr. Brown conceived the idea of building up the internal tube with a number of longitudinal steel bars or staves and wrapping them together under the tension of the steel wire. By this means he was able to secure a core having a much higher elastic limit than was obtainable in an ordinary tube.

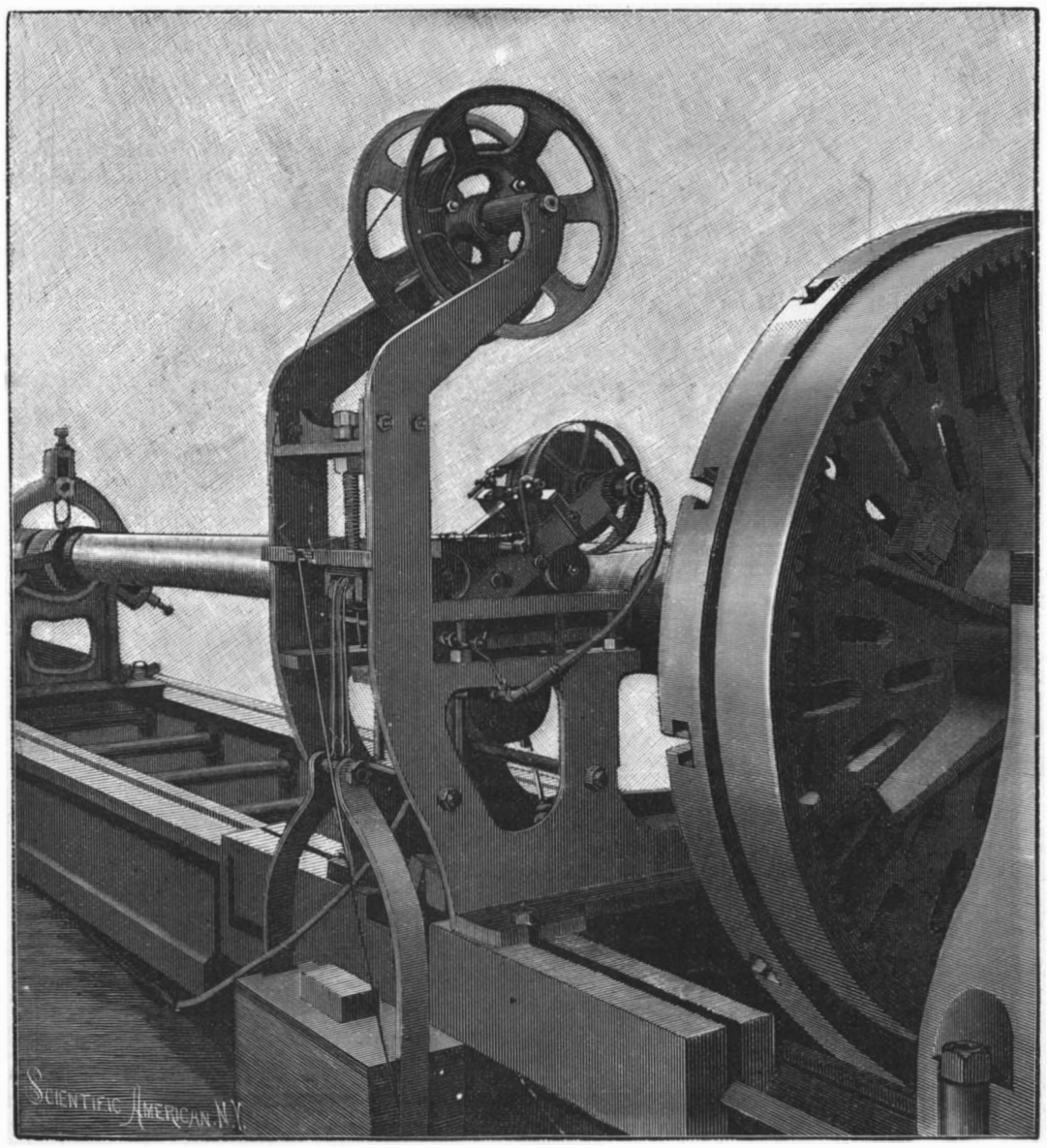
The advantages of this system of making the core are thus stated by Lieut. G. N. Whistler in his admirable theoretical discussion of the Brown segmental system:

1.—In consequence of the small weight of each of the component parts of the gun, crucible steel can be used economically. 2.—The small size of the segments, and the ingot from which they are rolled, admit of being carefully cast and uniformly forged, so as to insure uniformity of metal and of being thoroughly annealed. 3.—As they can be readily rolled into shape, the method of construction is exceedingly economical. 4.—They can be thoroughly and conveniently inspected. 5.—The size and thinness of each segment insures a thorough and uniform tempering and annealing, if temper be considered desirable. 6.—The size of the segments admits of readily setting up conditions of special elasticity by cold work.

This latter feature is by far the most important one in this system of construction, as it renders it possible to use a character of steel far beyond anything heretofore employed in the core of a gun. The core of such a gun whose bars or shoes have been hardened, annealed and cold drawn could readily be wound so



LONGITUDINAL AND CROSS SECTIONS SHOWING CONSTRUCTION OF THE TEN INCH BROWN SEGMENTAL WIRE GUN.



WINDING THE THIRTY-SEVEN MILES OF WIRE ON THE FIVE INCH BROWN SEGMENTAL WIRE GUN.

© 1896 SCIENTIFIC AMERICAN, INC.

as to produce a compression between the segments of 112,000 pounds to the square inch without exceeding the elastic limit of the weapon.

In the manufacture of the 10 inch Brown gun the production of the segmental core is the most novel feature. The segments, which are made from open hearth steel, are cold drawn and are tapered and beveled in the working. This is done so accurately that no machining is necessary. They are assembled vertically, with the large end down, in much the same way as a cooper assembles a barrel, and are temporarily held together with three-part clamps placed one foot apart. The core is then put in a lathe, the two ends are machined, and the breech and muzzle nuts are shrunk on. The lathe is then set at the taper of the finished gun, and the outside of the core is turned down from nothing at the breech nut to a depth equal to the thickness of the wire, at twelve inches from said nut. Here the operation is again repeated for another twelve inches, and so on until the muzzle nut is reached. The steel wire is $\frac{1}{8}$ of an inch square in section, with a sectional area of $\frac{1}{75}$ of an inch. The end of the wire is keyed into the gun at the breech nut and it is wound on at the required tension by means of the automatic winding machine shown in the accompanying cut. When the wire reaches the shoulder it is tightly wedged in against it, turned over, and keyed into the gun. The next layer is started at the second shoulder, 24 inches from the breech nut, and wound back to the breech. The third starts at the breech and runs to the third shoulder, the successive layers running in contrary directions until the necessary amount of wire is laid on. The gun is then bored out, heated internally by gas, and shrunk onto a thin steel liner. The chase jacket is shrunk on in two foot sections. The trunnion jacket is interlocked at the breech end by shrinking on, and fits with a slip joint over the chase. The breech closure is screwed into the projecting end of the jacket, and the trunnion ring is screwed on over the front end of the same jacket, as shown, so that the recoil of the gun is taken up directly by the jacket and transferred by the trunnions to the gun carriage. The longitudinal stress is taken in part by the longitudinal segments. In addition to this, the method of cross wrapping the wire in itself imparts considerable longitudinal strength to the gun.

The winding of the wire at a constant tension is done by the ingenious machine shown in the engraving. It consists of a stout frame, bolted to the lathe carriage, which is provided with a large overhead spool to carry the wire, and a small car which runs on a track at right angles to the axis of the gun. Upon the car are journaled two sets of adjustable steel rollers, between which the wire passes and by means of which the necessary tension is given to the wire as it passes to the gun. The pressure between the rollers is regulated by means of coil springs, controlled by thumbscrews. The two sets of rollers are geared to two brake wheels, which are seen above and below the car. The upper brake wheel has a fixed brake. The lower brake is automatic in its action and is controlled by the position of the car. From the rear of the car a set of wires passes over the pulley which is seen suspended between the vertical frames, and down to a bracket which carries a certain amount of dead weight. The winding is started with the weight resting on the floor. The handwheel on the brake is then turned until the weight is raised, when the tension in the wire equals the weight. As the car travels toward the gun, the brake wheel is released by an automatic gear and the car soon finds a position of equilibrium. The brakes are kept cool by the water pipes shown in the engraving.

The wire used in the construction of the 10 inch gun will have a total length of 75 miles.

The high quality of steel which it is possible to use in the segmental wire gun is evident from the official tests of the metal put into the 5 inch gun of this pattern. The segments showed an elastic limit [illegible] pounds per square inch and an ultimate strength of 176,000 pounds per square inch; the wire shows an elastic limit of 230,000 pounds and an ultimate strength of 262,000 pounds per square inch.

We would direct our readers' attention, bearing these figures in mind, to the accompanying diagram showing the curves of velocity, pressure, and resistance, from which it will be seen that, when using the battering charge, which gives the enormous velocity of 3,000 feet per second, the curve of powder pressure is never beyond 60 per cent of the elastic strength of the gun. If the segmental wire gun has the necessary endurance, and the army trials at Sandy Hook demonstrate that it has, its superiority over the hooped system of construction is obvious, and explains why the English navy has adopted the Armstrong wire gun as its standard weapon. For with the higher velocities of which the wire-wound gun is capable, the energy of the projectile per ton weight of the gun is enormously increased, with the result that of two ships of equal size, carrying the same total weight of guns, the ship armed with the segmental wire gun will have an enormous superiority of fire. For the same weight it can carry more weapons of equal power, or the same number of weapons of greater power.

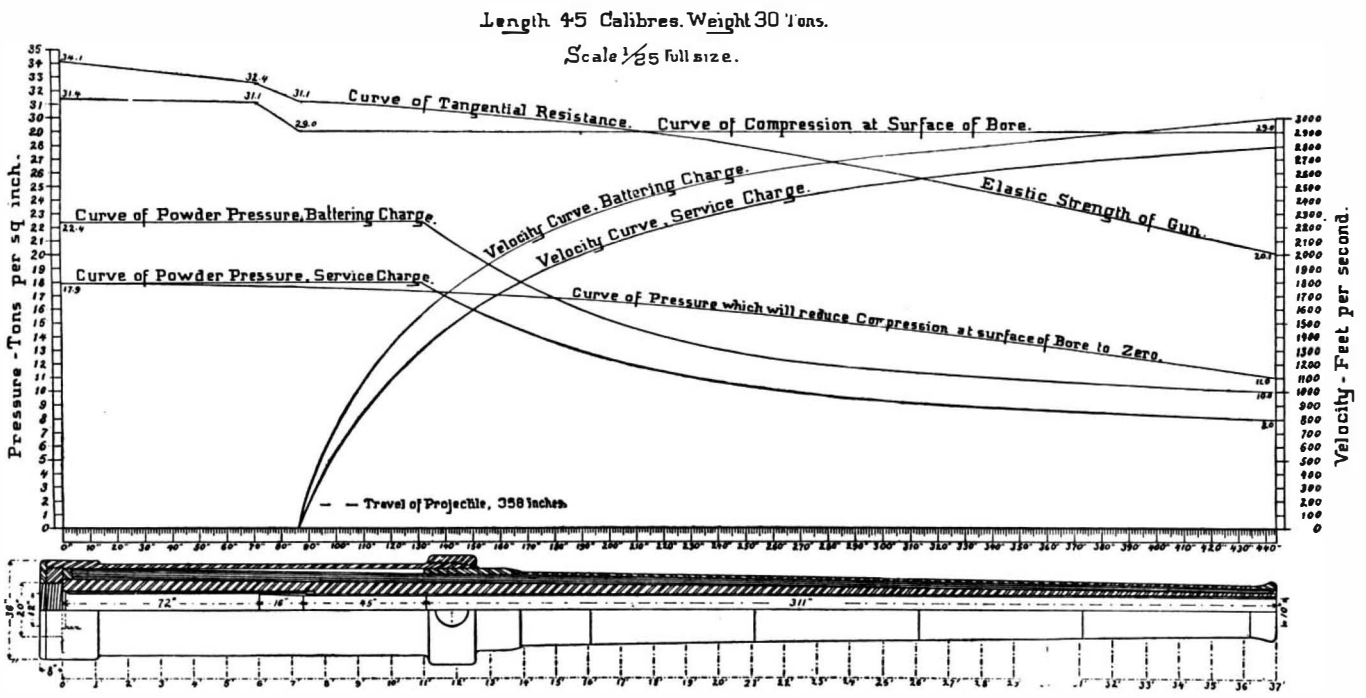

Length 45 Calibres. Weight 30 Tons.
Scale 1/25 full size.
Curve of Tangential Resistance.
Curve of Compression at Surface of Bore.
Curve of Powder Pressure, Battering Charge.
Curve of Powder Pressure, Service Charge.
Velocity Curve, Battering Charge.
Velocity Curve, Service Charge.
Elastic Strength of Gun.
Curve of Pressure which will reduce Compression at surface of Bore to Zero.
— — Travel of Projectile, 358 inches.
Pressure - Tons per sq. inch.
Velocity - Feet per second.

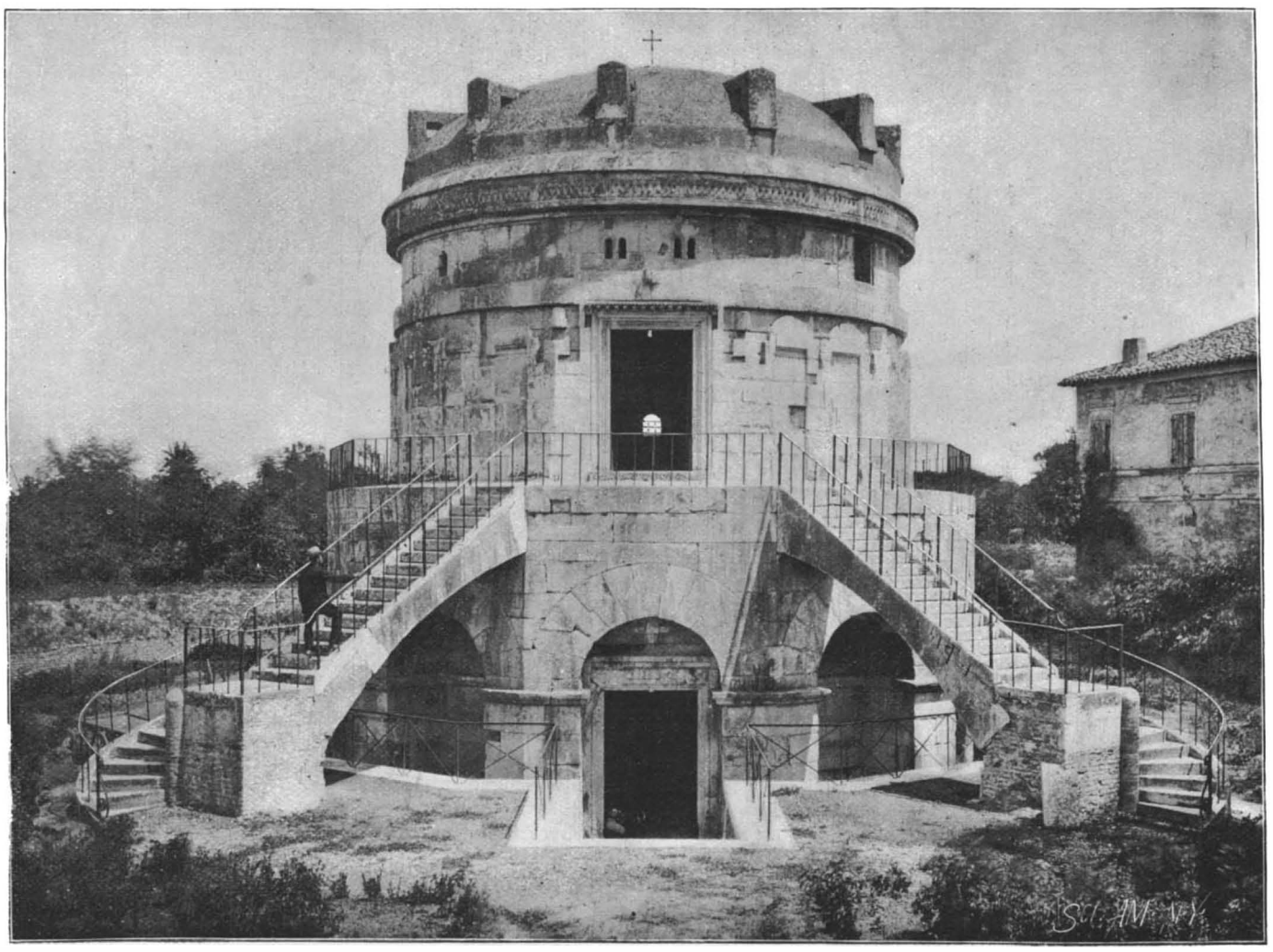
DIAGRAM SHOWING CURVES OF PRESSURE, VELOCITY AND RESISTANCE OF THE TEN INCH BROWN SEGMENTAL WIRE GUN.

This can best be shown by a comparison of the naval 10 inch gun, Mark II, of 28 tons weight, and the Brown 10 inch gun of 30 tons weight which is now being built. The hooped navy gun has a muzzle energy of 15,285 foot tons, whereas the Brown gun, which is only 2 tons heavier, will have 37,800 foot tons energy, which, be it said, is over 4,000 foot tons greater than the energy of the 13 inch hooped gun now in service.

Limits of space prevent any further discussion of this very live question. Enough has been said to show that the government is fully justified in its determination to build a gun of large caliber and give it a thorough test. It is not enough to say that our hooped guns are the best of their *kind*; we must have the best of any kind, and if the performance of the segmental wire gun is as good in the large as it has [illegible] as the service weapon for both army and navy.

THE TOMB OF THEODORIC AT RAVENNA.

There are few places which impress one with the idea of age more than Ravenna, the old Gothic city by the Adriatic. Even Rome itself with its modern improvements seems vastly nearer in time than the city of Theodoric and the Exarchs. Ravenna is enshrouded in an atmosphere of history and romance. Here was the seat of the later Roman emperors, and the center of the elaborate machinery of the state. Here Odoacer obtained his decisive victory, and where he was himself defeated and afterward assassinated by Theodoric the Ostrogoth; and afterward Ravenna became the governing center of the Byzantine dominion in Italy. Later memories are linked with the battle of Ravenna, when the flower of chivalry, Gaston de Foix, was killed, and here Garibaldi sought refuge. Ravenna has more peaceful memories, for here the exiled Dante wandered in the Pinetum, that glorious pine grove, extolled by the poet himself, and by Boccaccio, Dryden and Byron; and in Ravenna Dante lies buried, while in far away Florence the descendants



THE TOMB OF THEODORIC THE GREAT AT RAVENNA.

© 1896 SCIENTIFIC AMERICAN, INC.

of the men who exiled him have erected statues and memorials, but have been unable to obtain the ashes of the great poet, which is at least poetic justice.

In the history of art Ravenna occupies an important place. Indeed, in the history of art of the fifth to eighth centuries it is the most important place in Italy next to Rome, and the relation of Roman and Byzantine art may best be studied in Ravenna—the connecting link. The splendid basilicas, the fine mosaics, render this city one of the most interesting in Italy, but it pays the inevitable penalty of being off the main line by not being visited.

Ravenna owes its great historical importance and its present obscurity, from a commercial point of view, to the sea. It is situated on an alluvial plain, which was formed and extended by the deposits of the streams which have their origin in the Apennines, but what the sea and the rivers have given they have also taken away, and the once important seaport is now six miles inland and is connected with the Adriatic only by a narrow canal. The whole country around is intersected by dikes and is none too healthy.

Up on the marshy ground near the present port and railroad station is a monument, the like of which does not exist in Italy or in all Europe for that matter. This is the tomb of Theodoric the Great, which forms the subject of our illustration. Ravenna was the chief place of residence of the great Ostrogothic king, who reigned from 493 to 526 A.D. This may be considered as the greatest period of splendor in the history of Ravenna. He built himself a large palace, portions of which still remain; but this is inferior in interest to the massive mausoleum in the style of the tomb of Hadrian, at Rome. It was probably erected by Amalasuntha, the emperor's daughter, about 530. The substructure is of decagonal shape, and it is surmounted by an enormous monolithic flat dome, 36 feet in diameter, brought from the quarries of Istria. The weight of this enormous block of stone is variously estimated at from 300 to 470 tons. How this stone was ever quarried, transported and erected is an interesting problem. Some of the remains of the colonnade which shaded the balcony round the upper story are now preserved in the interior. The substructure, with its ten arches, long lay half under water. The upper part is approached by a double staircase of marble erected in 1780. The body of Theodoric was cast forth from this tomb, probably during the troublous times of the siege of Ravenna by the imperial troops, and the tomb became a place of worship, and is now called S. Maria della Rotonda, or generally called the Rotonda.

Toning Lantern Slides.

Th. J. Placzek, of Vienna, gives the following directions for the toning of collodion transparencies. If pyrogallic acid be used, instead of iron, for development, a pleasing blue-black deposit results, that can be easily toned with neutral chloride of gold, chloride of palladium, etc.; but the large addition of glacial acetic acid to the developer makes double the exposure necessary as compared with iron development. In consequence of this, attempts have been made to tone the grayish-black image of iron-developed positives, and the following bath has been found very useful:

Solution of potassium chloro-platinite (1:50)	4 c. c.
Nitric acid	12 drops.
Solution of chloride of gold (1:50)	3 c. c.
Distilled water	550 to 600 "

The plates, after fixation with hyposulphite of soda, or preferably cyanide of potassium, are well washed, and while still wet placed in the toning bath for one to two minutes. They acquire a blue-violet tone, which is found very suitable for lantern slides or stereoscopic transparencies. Dry collodion plates may also be toned in this bath, but the process is much slower, owing to the horny character of the collodion film, which resists the penetration of the solution. A bath of potassium chloro-platinite (1:1400), slightly acidified with hydrochloric acid, gives a blacker tone. A solution of—

Water	500 parts.
Sulphocyanide of ammonium	20 "
Hyposulphite of soda	½ part.

added in equal quantity to the following:

Water	500 parts.
Chloride of gold solution (1:50)	30 to 40 "

gives gray-blue tones. Platinum and gold toning is very successful with these baths.—Photographische Correspondenz.

An Elk Horn Fence.

At Mammoth Hot Springs, in Yellowstone Park, says the Kansas City Star, there is a fence made of elk horns. It incloses the greater part of the grounds of photographer F. Jay Haynes' studio. The fence is composed of over three hundred selected elk horns. All of them have twelve points, and a great many have the royal fourteen points. They were shed in March, 1895, and were gathered in June of the same year by Mr. Haynes and three of his men, within a radius of ten miles of Mammoth Hot Springs and within four days' time. There are about 2,500 elks in the park now. Each pair of horns would bring $7.50 at the railroad at Cinnabar, about eight miles, or at least $10 a pair in the East or South.

Correspondence.

Nest Building Fishes.

To the Editor of the SCIENTIFIC AMERICAN:

On seeing the article with the above heading in your issue of August 1, I thought to find a description of the good old stickleback, but on reading it I find it is Osphromenus olfax which is alluded to.

May I, as an early observer of the habits of this fish, correct a few of the statements made by your correspondent?

Os. ol., to begin with, can hardly be called a nest builder, as he builds absolutely no nest, the eggs do not rise when laid, and the female does not try to swallow them.

What really happens is that immediately after impregnation a batch of eggs is laid; as these sink slowly they are seized by both male and female in their mouths and expelled against the under side of some concave surface, either leaf or stone.

The eggs adhere to this, and when a considerable number have been deposited, the female rises to the surface and brings down air in her mouth, which she lets go under the eggs and which remains there in the form of bubbles, this being constantly repeated until it overflows, leaving just the exact amount which the concavity can hold.

The male, I believe, assists in this work, and otherwise makes himself useful in hunting away his near relations, who, not themselves engaged in breeding, look upon the stray eggs as a special luxury.

There are many remarkable points about this fish: in the adult stage it appears to use its gills when the water is wholesome, but takes no harm in water which would kill any other fish, as it then rises to the surface and appears to breathe atmospheric air.

The continuous aeration of the ova is not easily understood, and it would seem as if the same result would be arrived at—with considerably less trouble, and no increase of risk—if the eggs were rafted as in some other species.

Finally, this fish, though normally reaching a weight of twenty pounds, attains maturity, under certain conditions, and breeds when weighing less than one-eighth of an ounce.

There are other peculiarities which render it worthy of close study, but, so far as I know, it has not yet built a nest, which brings us back to the beginning.

CHAS. F. GILBERT, M.I.C.E.

Ex Eng Toungoo, L. Burma.

Remarkable Discoveries in Babylonia.

A correspondent of the London News gives the following account of the great success which has attended the work of the American explorers under the direction of Rev. Dr. Peters and Prof. Hilprecht in Babylonia.

"The discoveries made by two expeditions that have been and are still working in Babylonia are certain to arouse general interest. A French expedition has for some time been at work at Telo, and has been remarkably successful. But the American expedition has produced even more remarkable results. The firman authorizing the Americans to explore the mound of Nippur, or Niffur, was granted eight years ago. It was at Nippur where Sir Henry, then Mr. Layard, nearly lost his life from the attacks of the Arabs. The University of Pennsylvania undertook an expedition at its own expense, and the Rev. Dr. Peters, an Episcopal clergyman, now in charge of a church in New York, was placed at the head of an exploring party intended to excavate at Nippur. He was aided by Mr. Haines, a young man who had been a tutor in Robert College, and who still continues connected with the explorations. At present the head of the expedition is Prof. Hilprecht, an American, who occupies a foremost place in everything relating to Babylonian archæology. Upon him has devolved the task of classifying and deciphering the enormous number of inscriptions which have been found at Nippur. The labor of piecing together the thousands of fragments of vases and other objects, and of deciphering the inscriptions upon them, has during the last winter nearly cost him his eyesight. Happily he is now recovering, and is at present in Constantinople arranging and classifying the inscriptions and objects of priceless value, which, under the conditions of the firman, become the property of the Imperial Museum.

"Prof. Hilprecht informed me that it will be years before the Pennsylvania University will be able to publish all the inscriptions which have been deciphered, but the publication has already begun and gives promise of a rich harvest. The first and most notable result of the excavations is that the history of the Babylonian people, as recorded in cuneiform writing on tablets, is carried back at least 2,250 years further than it had yet been known. In other words, there is now abundant written evidence that the Babylonian people existed and were civilized enough to be able to write at least 7,000 years before Christ. In conversation with the professor, who in all matters of archæology is cautious, I asked whether he could say that the written records did not go further back. He replied that, in his judgment, they probably went back as far as 8,000 years B. C., but that in his published records he was unwilling to print anything which could not be amply borne out by evidence. To have pushed back written history at one stroke by 2,250 years is, however, enough to make a reputation. In reply to my inquiry how it happened that his predecessor had not found the many objects belonging to this early period, he explained that Dr. Peters, to whom he attributed great credit for the manner in which he had opened out the great mound at Nippur, had worked down to a certain floor or platform which he and others had taken to be the ground level of the ancient city. One of the party, however, suggested that this level should be penetrated and digging continued until rock or virgin soil was reached. This suggestion was adopted, and to the delight of all concerned it was found that what had been taken for the level of the ancient city was only the level of a comparatively modern city built over the ruins of an older one or a succession of older ones. The excavations above the level or platform had gone through 36 feet of debris. They were now continued to a depth of 30 feet below it. The excavations above the platform discovered remains which covered a period of 4,000 years of Babylonian history. Below the platform to the virgin soil was an accumulation of drains, preserved and broken pottery, and various other objects of interest. Twenty-three feet below the platform Mr. Haines came upon the most ancient keystone arch known, an arch which Prof. Hilprecht thinks cannot be later than 5000 B. C. Last summer Mr. Haines, who has spent the last three years in continuous work at Nippur, excavated the lower part of the marvelous wall of the city. Its foundations were found to be 16 feet below the level of the desert; the wall itself was 17 feet high and 45 feet wide. Upon the top of this wall was another of unknown height. These walls were built of bricks 20 inches square—probably the largest bricks ever used. The most valuable finds, however, were the inscriptions upon broken vases, bricks, tablets and other objects, and from these it is confidently predicted by Prof. Hilprecht that a continuous history of Babylonism will be able to be written.

"Among the recent finds of the French expedition which has been and is still working at Telo are a number of dated cuneiform tablets of Sargon I and of his son, Naram-Sin. These have now reached Constantinople, and within the last two months have been submitted to the examination of M. Hauzey, director of the Museum of the Louvre, and of Prof. Hilprecht, who has been retained by the Turkish government to decipher and classify the objects found by both expeditions. By this important find all questions as to the mythical character of Sargon are put an end to, and he is shown to have been a real person. The contents of the so-called Oman tablet are definitely decided to be historical and not mythical. One of the new tablets speaks of 'the year when Sargon marched against Palestine' (Martu). This was 3800 B. C. Even were no other finds to be made, the inscriptions gathered by the two expeditions will add largely to the knowledge possessed of the history and civilization of Babylonia. The truth is, however, that there is every reason to suppose that there exists an untold store of archæological riches buried along the shores of the Euphrates and Tigris. Books on the subject which were up to date three years ago already require revision, and there is reason to believe that the efforts which the Americans and the French are making in a field first opened by Layard will be amply rewarded."

Learning to Ride a Bicycle.

A writer in our English contemporary St. Paul says: I can never understand the difficulties some beginners meet with. I know one lady who took four weeks before she could "ride alone," without being held. The time should be about four hours. Of course it takes a couple or three weeks' steady work before any one can ride really well. In my opinion it is a great mistake to learn in a riding school. The only way to ride well, with confidence, power, and ease, is to struggle alone, with an experienced friend at hand to tell you what to do. It is useless to sit on a cycle and be pushed along a flat road. Take your cycle into a field. If you are a woman, leave your skirt at home. There try a mount. Go on trying until you succeed. Never mind a fall, it will teach you how to fall with safety when you really meet with an accident. When you can mount, ride as far as you are able. Proceed until you can turn corners and feel confidence in your machine. Then ask your friend to mount his machine and ride toward you so that you have to get out of his way. Three days of this work will turn you into a very fair cyclist; a month will find you proficient.

Street Railways of Berlin.

The street railways of Berlin, Germany, comprise 55 different lines, of an aggregate length of 226 miles. One hundred and sixty-four millions of passengers were carried in 1895. The number of regular employes is 4,951. The heaviest traffic is at the Potsdamer Platz, where there is an average of 244 cars per hour.—Uhland's Wochenschrift.

© 1896 SCIENTIFIC AMERICAN, INC.

A COMPANION OF THE SUNFISH.

BY C. F. HOLDER.

Around the southern islands of the Santa Barbara group, where the tides come up and down in fitful measure, is a famous feeding ground for the sunfish of the Pacific, Mola mola. This extraordinary member of the family, though standing high in the list of fishes, is very unfishlike in appearance, resembling some Japanese monstrosity. The fish is more or less oval, covered with a hard skin that is enveloped with a thick mucus. The dorsal fin is large and high, and directly below it extends the anal fin, which resembles it in size and shape. Tail the mola has none, the body apparently being chopped off, a mere ridge, controlled by powerful muscles, taking its place and being entirely useless in the sense of a tail.

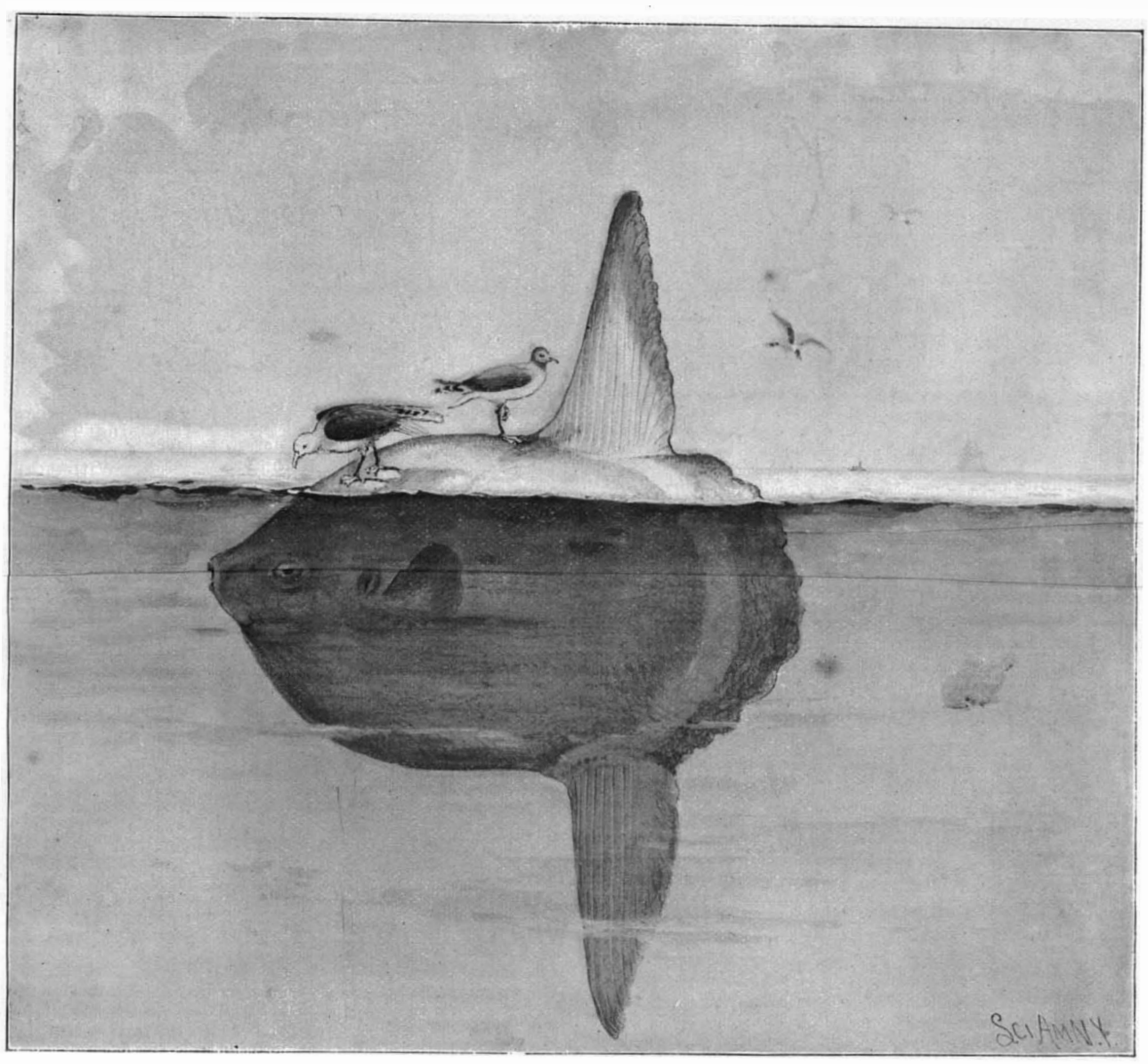
Thus equipped the sunfish would naturally be a slow swimmer, and so lethargic is it that the writer has often approached it in a boat. On one occasion a boat hook was hooked into the gills of a large sunfish, which was caught with little or no resistance.

One of the largest specimens observed by the writer grounded on the bar of the St. John's River and attracted so much attention that it was caught and carried ashore where it was provided with red eyes and exhibited as a "sea monster." The fish was ten feet high, or that measurement between the tips of the upper and lower fins. A much larger specimen, eleven feet high, was observed in California waters.

Off the islands of the Santa Barbara channel these fishes are very common in midsummer, lying at the surface in the choppy sea and apparently exposing their sides to the hot semitropic sun. When lying in this position, the sea washing over them, they resemble a piece of wreckage, and are, without doubt, so considered by numbers of birds, especially the shags, which, when weary from long flight and preferring a dry roost, alight on them and retain their position without alarming the fish. Several birds have been observed resting on a single sunfish, and some of the fishermen assume that the fish, being infested with parasites, take this position either to allow the sun to destroy them or thinking that the birds will devour them. In all probability the matter of parasites does not enter into the question as an explanation. The fish enjoys floating at the surface where the water is warm and the birds alight upon it simply as a rest, just as they would upon any floating object.

Sunfish could be caught in numbers off the islands mentioned, but no use having been discovered for them, they have no market value. Their muscles are so hard and elastic that when cut into small pieces and thrown upon the ground they rebound. In one small seaport the writer found that the elastic tissue was used by the fishermen's boys in the manufacture of baseballs.

The young of the sunfish is a singular looking little creature, hatching from eggs deposited on the high seas, floating at the surface. They were supposed for many years to be a different species, so unlike were they in general appearance to the adult sunfish.



MOLA MOLA, THE SUNFISH OF THE PACIFIC.

Remarkable Icelandic Features.

Iceland offers such exceptional advantages and opportunities to the sportsman, the tourist, the naturalist, the mountaineer, and the seeker of health, that, in no distant future, it is destined to become the tourist field of Europe. The glaciers of Switzerland, the fjords, the salmon rivers, and the midnight sun of Norway are all there, and, moreover, the volcanoes, grottoes, and solfataras of Italy, on a grander scale; the pure and clear atmosphere of Italy, the mineral springs of Germany, and the geysers or hot springs of the Yellowstone Park, are all there. Nowhere has Nature been so spendthrift in assembling wonderful phenomena on one spot, says the Philadelphia Ledger.

The summer lasts from June till the first week in October. A feature noticed by all travelers is the clearness and purity of the atmosphere, rivaling that of Italy; mountains are distinct at a distance of 100 miles.

There is no country in the known world where volcanic eruptions have been so numerous as in Iceland, or have been spread over so large a surface. No part of the isle is wholly free from the marks of volcanic agency; and it may be truly called the abode of subterranean heat. Vesuvius is dwarfed into insignificance by the twenty volcanoes of Iceland, all of them larger. The lava flood at the eruption in Iceland in 1875 has been computed to contain 31,000 millions of cubic feet, while the largest eruption of Vesuvius on record, that of 1794, threw out only 730 millions of cubic feet of lava. Some of the Icelandic lakes are studded with volcanic isles, miniature quiescent Strombolis, whose craters rise from bases green with a prolific growth of angelica and grasses. Even in the bosom of the sea, off the coast, there are hidden volcanoes. About the end of January, 1783, flames were observed rising from the sea some thirty miles off Cape Reykjanes; they lasted several months, until a terrible eruption commenced 200 miles away, in the interior, when they disappeared. A few years ago rocks and islets emerged from the sea in this place. Another volcanic feature is the solfatara valleys, plains studded with a number of low, cone-shaped hillocks, from whose tops jets of steam ascend. In other places boiling mud issues from the ground six to eight feet in the air, as in New Zealand. Standing on the feeble crust where literally fire and brimstone are in incessant action, having before your eyes terrible proofs of what is going on beneath you, enveloped in vapors, your ears stunned with noises, is a strange sensation.

As to the hot springs, those in Reykjadal, though not the most magnificent, are perhaps the most curious among the numerous phenomena of this sort in Iceland. On entering the valley you see columns of vapor ascending from different parts of it. There is a number of apertures in a sort of platform of rock. The water is at 212° Fahrenheit, and it rises two or three feet into the air. A river flows through the valley, in the midst of which a jet of boiling water issues with violence from a rock raised but a few feet from the icy cold water of the river. Not far from this place is the grotto or cave of Surt, which is so large that no one has penetrated to its inner end. In forming these scenes Nature seems to have deserted all her ordinary operations and to have worked only in combining the most terrific extremes which her powers can command. Nor is she yet silent. After the lapse of ages the fire of the volcano still bursts out among regions of eternal snow, and the impetuous thundering of the geysers continues to disturb the stillness of the surrounding solitude.

Iceland is a wide field open for discovery, and the country everywhere presents objects to fill the mind with astonishment.

On any part of the coast one will find innumerable gulls, eider ducks, etc. In the interior, wild ducks, grouse, whimbrels, plovers, and snipes are plentiful on the moors and heaths. Here are the best stocked, unpreserved moors in the world; twenty to thirty brace of grouse can be bagged by a fair shot in the course of a few hours. Besides, here are swans, curlews, and the chance of a shot at a reindeer.

A picturesque scene is the annual killing of blackbirds and auks, which nestle in the almost inaccessible rocks along the coast. Some of these are as high as 1,000 feet, and their clefts and ledges can only be visited by letting yourself down in a line fastened on the top. The line consists of four to seven thongs of ox hide twisted together, strong enough to carry a man and his booty.

The rock climber has a long stick in his hand to balance himself; one of its two ends is an iron crook, the other a snare of horsehair to entrap the birds. Some lines are sixty to eighty meters long, and every climber has two, one of which he pulls when he wishes to be hauled up. Coming to a ledge in the rocks, he unties himself and walks along, picking up eggs and killing birds. Of course great dangers are attached to this manner of fowling. A sharp edge projecting from the rock may cut the line. The climber may inadvertently loosen a stone or make a false step. Then the unhappy man is invariably torn to pieces by projecting angles and edges in the rock before he finds his grave in the merciful deep below.

The water of the aerated springs in Iceland possesses a strong but grateful degree of pungency, very much like that of soda water after it has been exposed to the air for a few seconds. The water is kept in constant and violent agitation by the escape of carbonic acid gas, and, taken in large quantities, may cause intoxication. The natives call these springs ale wells.

The accommodation in Iceland is not equal to that which the Land of the Midnight Sun and Switzerland give to the traveler. The only hotels to be found are in the half a dozen towns on the coast. In the interior one must take lodgings on a farm or camp out in a tent. It should not be omitted to state that the only mode of conveyance is on horseback, on the ponies which have been praised so much by every traveler who has written upon Iceland.

Iceland has the same right as Norway to be called "The Land of the Midnight Sun." The midnight sun can be seen in the north of the island. There is the difference that this seagirt Land of the Midnight Sun is unexplored.

Tugs Carried by Steamers.

The Hamburg-American line has recently acquired two steel tugs, about 30 feet long, each furnished with a 10 horse power petroleum motor and capable of hauling a load of 300,000 pounds at a speed of over 9 miles an hour. These tugs are to be stationed in the West Indies, and will be carried from one port to another by the steamers of the Hamburg-American line for the purpose of hauling lighters. The company is thus independent of any local deficiencies in the lighterage. The petroleum motors are of great advantage, as they are ready for starting upon short notice, and require no boilers or coal bunkers.—Uhland's Wochenschrift.

© 1896 SCIENTIFIC AMERICAN, INC.

RECENTLY PATENTED INVENTIONS.

Engineering.

GAS GENERATING MACHINE.—John A. Enos, Washington, D. C. To generate gas for illuminating or heating this inventor has devised a machine by which a constant supply of air will be forced through the generator, preventing variations of the flame, the generator cylinder being so operated that all the heavier oils will be acted on by the air pressure. The generator cylinder is slowly rotated, to keep the heavy oil in constant movement through the absorbent material, which is held between perforated diaphragms, and the side and end walls of the cylinder are corrugated to counteract contraction and expansion.

Railway Appliances.

CAR COUPLING.—Martin L. Mardis, Salem, Ohio. This invention relates to couplings of the Janney type, and provides improved means for locking the knuckle in operative position, while a releasing device actuated by the locking means engages and opens the dog to unlock the knuckle. The locking device may be actuated from the car platform or the top or side of the car, a locking dog or latch engaging and locking the knuckle in its closed position, and a knuckle releaser operated by the dog pushing the knuckle open when the dog is thrown out of engagement with the knuckle. The mechanism is so arranged that it is not liable to get out of order.

RAILWAY CROSSING.—Daniel Collen, Inwood, Canada. This invention provides continuous rails for the easy and safe passage of the wheels of a train and at the same time provides danger signals for approaching trains in case the crossing is open. There are fixed rail sections at the diamond, and endwise movable rails at opposite sides in longitudinal alignment with the fixed rail sections, the movable rails being between the fixed sections of the diamond and the track rails.

AUTOMATIC AIR PIPE COUPLING.—Wiley E. Crowson, Montgomery, Ala. To automatically join the ends of air-conducting pipes on trains, and hold them in airtight condition while the cars are coupled, according to this invention, the main coupling sections are made with male and female coniform coupling heads, the male head being elastic, and each head connected to an elongated body made up of portions joined in sequence with intervening elastic joint pieces. The slightly yieiding main coupling sections are secured on the ends of the car frames and are spring-pressed forwardly, being sufficiently projected to adapt them for engagement with each other. Each main section has an interior sealing valve controlling the air passage, the valves automatically closing when the joined main sections are detached by uncoupling the cars.

ANGLE COCK.—Thomas A. Oothouse, Mount Olive, Ill. To automatically cause the brakes to be applied in the rear section or a train when the train has parted or the hose has burst, without applying the brakes at the front of the train, this inventor has devised a valve to be arranged in the cock body, controlling ports one end of the angle cock body, the other ends of the ports registering with a port leading to a chamber in the angle cock body in which is a seat for a valve, a spring normally holding the valve off the seat.

NUT LOCK.—Charles T. Redfield, Glen Haven, N. Y. This improvement is especially applicable in connection with a railway fish plate, which is made with perforations adjacent to the nut to receive a wire-locking device, the wire ends being passed through the fish plate and bent to engage the nut. The arms at the ends of the wire are untempered, and the improvement affords a positive locking device of very simple character.

Miscellaneous.

LUMBER PILING.—Howard Daniels, Atlanta, Ga. Two patents have been granted this inventor in this line, one of which is an improvement on an invention patented by him in 1893, and relates to machines by which the lumber is piled on edge. The machine has a swinging conveyer frame to be lowered to receive the lumber from a chute and lift the courses successively to position on a truck, the courses being supported by a pile-retaining bar which is movable into and out of position in rear of the lumber pile as the successive layers are applied. The stakes separating layers of boards are fed positively to the swinging conveyor frame, one at a time, by a stake feeder at each side as each layer of boards is moved upward. The other patent provides a simple and easily operated apparatus forming a hand machine which can be built at so small a price that one can be set at the head of each kiln. Transfer cars or trucks may be dispensed with if desired, and the machine can be adapted to kilns which take the lumber through endwise, without any expensive provision for changing the direction of the load. The machine comprises a carriage with upper receiving portion or loading bench and a piling portion connected therewith, a curved guiding device directing the lumber to the piling portion.

NECK YOKE.—James S. Brown, Eureka, Cal. According to this improvement a tip ferrule is removably held on the pole and a clip secured to the neck yoke is capable of pivotal and removable connection with the neck yoke, the latter thereby being conveniently connected with the pole and having proper movement thereon without danger of becoming disengaged, while the reins cannot become entangled with or caught by the yoke. The invention also provides means for lengthening the pole when desired, according to the character of the team to be harnessed.

FENCE POST.—Levi M. Brock, Mackinaw, Ill. A tube of sheet metal slitted down one side forms the body of this post, the lower end having a spiral flange which acts as a screw, by means of which the post may be inserted in the ground with a pipe wrench or other tool. The post has a cap on its upper end, and a wooden core which slightly spreads the edges of the tube, exposing the wood for sufficient space to permit of driving staples therein for the attachment of wires or for the driving of nails to attach boards.

EXTENSION TABLE.—James Stephens and Gilbert De Marce, Canisteo, N. Y. This table has two sections capable of relative sliding movement, one section having a stationary top and the other section having a series of movable top sections capable of swinging downwardly and inwardly to move beneath the stationary top of the first section. The extension leaves are by this arrangement at all times attached to the table, thus preventing their loss and facilitating the quick extension or contraction of the table as desired.

LAUNDRY LIST INDICATOR.—Richard Lundqvist, Laguna de Terminos, Mexico. This is a device on which to keep a record list of the number of pieces sent to a laundry and for other similar uses. It consists of a circular board with central inscribing surface, on which the date may be written, radial inscribing surfaces to accommodate the names of the articles, and an outside inscribing surface on which the number of pieces are marked. The device turns upon a handle.

BOOTH.—Albert F. Hunt, Jr., and George L. Walker, New York City. For the exhibition or sale of goods these inventors have designed a booth which may be either stationary or portable, and especially adapted for markets or fairs, where stands are required for the sale of fruits or merchandise. The invention comprises standards on which are mounted series of shelves, elevated by counterbalancing, and, when not wanted, the whole or any part of the contents of the stand may be elevated, leaving the space clear underneath.

BICYCLE GEAR, ETC.—Weston E. Watkins, Phelps, N. Y. To convert an oscillating foot or hand motion into rotary motion, as required in bicycles, tricycles, or machinery, without the aid of chains, springs, connecting rods or combinations of levers, this inventor has devised an improvement according to which a sleeve is secured to each of two levers, the sleeves turning on a stationary axis on which revolves the wheel hub, while a toothed segment secured to each sleeve operates converting gearing, and the latter actuates clutch devices engaging and revolving the hub. The vertical movement of the pedals rocks the sleeves, and they transmit their movement to the toothed segments working alternately in opposite directions, and both engaging pinions in connection with the clutch mechanism. Roller bearings are employed to lessen the friction, and the improvement may be applied to a bicycle wheel of any approved construction.

OVEN THERMOMETER.—Lizzie S Barndollar, Trinidad, Col. This improvement is more especially designed for use with cooking stoves, to enable the cook to regnlate the fire according to the heat required to properly cook different articles. It consists principally of a perforated casing in which is journaled a pointer provided with a crank disk, a lever fulcrumed in the casing being connected with a compound expansion bar and with the crank disk. The thermometer is set in the door of the oven and the heat circulates through it and acts on the expansion bars, which may be readily set to the desired degree of heat to cause the pointer to move and indicate properly.

MAIL BAG.—Fred L. Boynton, King Fisher, Oklahoma Ter. According to this improvement the mail bag is made with a folding flap through holes in which are passed bolts with enlarged heads, two slotted straps being scured to the back of the sack, with flat metal plates on opposite sides of the slots, metal arches rigidly connecting the plates, and a staple projecting through the lapped ends of the straps. The fastening is designed to be secure and durable, and may be manipulated with ease and rapidity.

OIL WELL TOOL FISHING.—George L McKain, Washington, Pa. This invention comprises a tool carrier provided with slips adapted to grip within the removable casing, holding the tools up in the casing while the latter is being removed from the well. The carrier is designed for use within a casing smaller than the large starting casing, the smaller casing being lowered down to a point near where the tools are stuck in the well, and a fishing tool of any desired character is made a part of the carrier.

COUCH OR BED HINGE.—Ambrose Hutinger, Cleveland, Ohio. This invention provides a locking device for the hinges of a couch or bed operated from either side of the couch, the locking devices normally holding one member of the hinge in the position to which it may be adjusted relative to the opposing member. When the head of the bed or couch is horizontal, it may be carried up to any desired position, when it will be automatically locked in place, or, by pressing on a foot lever, the head may be lowered and automatically locked in lowered adjustment.

ANTI-REFILLING BOTTLE.—Willis A. Smith, New York City. This bottle has at the lower end of the neck, on the outside, a collar having an easily breakable connection with the neck, and on the inner face of the collar is a recess engaged by a locking wire, which also extends through a recess in a cap fitting over the neck. When the bottle is thus closed it is necessary to break the collar or the cap to get at the contents of the bottle. The device is also applicable to fruit jars, etc., and applications have been made for several foreign patents upon the improvement.

SALES COUNTER ATTACHMENT. Hugh Walkinshaw and James Kapp, Lebanon, Mo. According to this improvement, a sliding yard stick is arranged to be moved in a groove along the edge of the counter to facilitate the measuring of goods. In the edge of the counter is a dovetail groove, and the yardstick has a dovetail rib that fits in the groove, allowing the yardstick to slide freely parallel to the edge of the counter.

CORK CABINET. George M. Wilson and Harry J. Neely, Wilbur, Washington. For holding corks of different sizes in place to be readily accessible for use, these inventors have devised a case to whose door on the inside are secured cork-holding tubes, which extend down below the door, so that corks may be withdrawn from any of the tubes when the door is shut. The drawers in the case hold supplies of different-sized corks. The tubes are crimped at their lower ends to retain the larger ends of the corks, whose smaller lower ends project in position to be withdrawn as required.

DISPLAY CARD AND HOLDER.—William F. Jones, Baltimore, Md. This is a card upon which packages of medicines and other small articles may be held by means of an integral cut out portion in the form of a loop, which may be bent outward to serve as a clamp to embrace and hold the package and yet permit it to be readily detached. A folding brace is attached to the back of the holder to support it on a shelf or counter, or it may have a loop or eye by which it may be hung up.

FOOT FOR PITCHERS, ETC.—William McAusland, Taunton, Mass. To support pitchers, tea and coffee pots, etc., on trays, without scratching the latter, this inventor has devised a foot of globular form, but with central hollow space, in which is embedded a slightly projecting block or pad of cork, which is made to fill the hollow space and present a rounded bottom surface, which is both noiseless and durable.

CUTLERY HANDLE.—William B. Steeles, New Britain, Conn. This handle has a kerf at one end to receive the butt portion of the blade, the walls of the kerf being inclined to receive the transverse taper of the blade, and the handle also having throughout a lengthwise longitudinal perforation in which is a tube of spirally wound wire, the tang portion of the blade by its pressure forcing the outer ridges of the tube into the material of the handle. The construction is designed to be especially adapted for butcher knives, scraping knives, shoe knives and various forms of cutlery, there being no danger of the edge of the tang cutting into or splitting the handle when pressure is brought on the edge of the blade.

FLEXIBLE PIPE JOINT.—Andrew P. Jerguson and William W. Hunt, Hull, Fla. This invention provides a double ball joint in the end sections connected with the hose, the improvement being especially designed for use on suction pipes for sand pumps and other machines. The entire joint is inclosed by flexible corrugated tubing, to prevent leakage between the sections, and a full-sized bore is made through the joint for water, sand or other material.

WHEELED EARTH SCRAPER.—Joseph W. Hobson, Bayonne, N. J. In this scraper the scoop is suspended from a crank axle, permitting it to be carried in a horizontal position to deliver its contents where desired, the scoop being readily lowered to position for scraping the surface of the ground, and having a front gate to be closed for retaining the earth while being transported, and automatically raised when the scoop is being dumped.

TROLLING HOOK.—Allen H. Smith, Snoqualmie, Washington. A rod slidable in a tube, according to this improvement, has the shanks of hooks pivotally connected to one end with the points of the hooks passed through openings in the tube. The rod may be moved to bring the points of the hooks within the tube, when the hook may be safely carried in the pocket. The moment the hook is taken by the fish it fastens itself strongly in position, but it may be removed from the mouth of the fish without introducing the fingers in the mouth.

BEDSTEAD.—Melbert Dumas, Ripon, Wis. The side rails of this bedstead have lengthwise channels on their inner side in which are secured metal strips, bent outward at intervals to form sockets engaging the hook portions of stirrup hangers. The cross slats are supported by these hangers, thus making a bedstead of unusual strength and one that it will be practically impossible to break down with the customary use.

COUNTER AND SHOW CASE.—Joseph H. Gimnich, Red Wing, Minn. This is an improvement designed to facilitate the display, storage and handling of nuts, fruits, candies, etc., the counter being raised from the floor to keep its contents clean and dry, and being provided with trays or display boxes and dust-proof drawers. Any one or more of the trays or boxes may be rearranged or removed without inconvenience and without disturbing the counter or its contents.

HEATING BURNER.—Herman Rosenthal, New York, and Ludwig Kramer, Brooklyn, N. Y. In this burner air and gas are thoroughly commingled, whereby a minimum amount of gas is burned for a maximum of heat. The burner has a duplex mixing chamber, an outer chamber within a cylindrical casing and having an open end covered by a wire netting diaphragm, while an inner cylinder around the inner end of the receiving tube constitutes an inner mixing chamber. A bifurcated pipe connected with the inlet pipe supplies the proper proportions of air and gas. The burner is of simple and inexpensive construction, and all its parts are interchangebly and removably connected, so that they may be quickly and thoroughly cleaned.

PHOTOGRAPHIC CAMERA.—Frederick H Sanderson, Cambridge, England. This invention provides means of supporting the lens-carrying front of a bellows body camera, rendering adjustment of the lens possible by a single motion, the picture being roughly focused and the lens at the same time raised or lowered to include as much of the subject or foreground as may be required, while the use of a swing back is rendered unnecessary to maintain the perpendicularity of the upright lines of an architectural or similar subject. Two pairs of slotted and curved arms are pivoted at each side of the front of the camera bed, and screw-threaded pivots on opposite sides of the camera front project through the slots of the arms.

AUTOGRAPHIC REGISTER.—George D. Bond, Hillsborough, Texas. To register fares paid by passengers and to keep account of cash receipts by salesmen, etc., this inventor has devised a small, portable ticket holder and registering device, having a tension device for a ticket strip and which is also a guard and ticket cutter. The register case has a transverse aperture below which is a table on which a carbon strip is held, a transverse roller holding a rolled ticket strip, while two other rollers carry a record strip and gearing transmits motion from the ticket holding roller to one of the record holding rollers

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue

Marine Iron Works. Chicago. Catalogue free.

"U. S." metal polish. Indianapolis. Samples free.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Yankee Notions. Waterbury Button Co., Waterb'y, Ct.

Handle & Spoke Mchy. Ober Lathe Co., Chagrin Falls, O.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Spring & Varick Sts., New York.

Concrete Houses—cheaper than brick, superior to stone. "Ransome," 757 Monadnock Block, Chicago.

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4. Munn & Co., publishers, 361 Broadway, N. Y.

Free! An Illustrated History of Cripple Creek gold camp (with correct map), together with our big family weekly, three months on trial for 25c. Illustrated Weekly, Denver, Colorado.

Wanted.—A young man of energy and some business experience, with a practical knowledge of the machinist trade, with a small sum to invest in a good business. To such a one with undoubted references a good opening is offered. Address W. A., Box 773, New York.

Electricians claiming they have primary batteries that will give one-half actual horse power or upward, not weighing over 100 pounds—preferably several batteries—with life of 10 or 12 hours each charging, will please write to "Electric," care SCIENTIFIC AMERICAN, giving size of batteries, cost in quantities, and such other particulars as they choose.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

NEW BOOKS AND PUBLICATIONS.

SCRIBNER'S POPULAR HISTORY OF THE UNITED STATES. From the Earliest Discoveries of the Western Hemisphere by the Northmen to the Present Time. By William Cullen Bryant, Sidney Howard Gay, Noah Brooks. With more than sixteen hundred illustrations and maps. Five volumes. New York: Charles Scribner's Sons. 1896. Pp. xlii, 562; xxviii, 605; xxv, 628; xxiv, 585; xxxiii, 732. Price $20.

Perhaps no portion of Livy's history holds such deserved fame as the preface, wherein in two short pages the condition of Rome, already gradually going down the path to decadence, is so beautifully and incisively portrayed. Of the present work it may almost be said that it was worth being written to elicit the preface, written by William Cullen Bryant in the year 1876. The general history of the work is this: It was planned out and the plan was laid before Mr. Bryant in 1874, and work upon it was at once begun. Mr. S. Howard Gay, who had long been the chief assistant editor of the Evening Post, was chosen to write it under Mr. Bryant's supervision as editor, with numerous assistants in the work, including Rev. Edward Everett Hale. The work was originally carried down to the beginning of the civil war. The value of a book prepared under these auspices is self-evident. It was profusely illustrated, and among the illustrations appear trophies of the artist's and engraver's arts which represent the most celebrated illustrators of America. This was some thirty years ago. In the great rush of events of the last three decades, what we have written already seems like ancient history, but the book has since then been brought down to recent times by the addition of another volume prepared by Mr. Noah Brooks, whose work involved also the re-writing of a portion of the fourth volume, so that now the work comes down to within a few months of the present time. The fifth volume, with its picturesque and accurate account of events of the present generation and with numerous illustrations, is in itself a work of great value; and the contemporaneity of much of the two preceding volumes, referred to the events they tell of, gives them a status in respect to the war between the States which cannot fail to be recognized by all chroniclers. The book stands unique, and the very partisanship that appears in the portions treating of recent times was a necessary incident to the methods of its production and really gives it a definite value. The preface portrays briefly and conservatively the great question that brought about the war—the slave question; the sudden disappearance with the war of that question from American politics; the feeling of European nations toward the United States during the war; France's menace on the southwest and England's watchfulness across the seas; the full significance of the recovery of the States from the shock of the civil war, and the unfortunate after-effects of that war in the bringing about of crimes of violence and crimes against property; the opposing policies of protection and free trade during the century preceding 1876; its lapse and its later revival, with the prediction that circumstances "strongly imply that we have the same ground to go over again"; the bad effect and danger of the issue of paper money; the danger of undue centralization of government, are among the topics treated almost with prophetic force by the veteran editor and poet. To-day it is of especial interest to read the record by Mr. Bryant of what he terms "the great triumph of the cause of peace and civilization in the settlement of our collateral quarrel with Great Britain, a quarrel which at other times might be easily worked into a war." This utterance referring to the Alabama claims may with startling accuracy be applied to the late triumph of civilized methods in the settlement of the Venezuela case.

© 1896 SCIENTIFIC AMERICAN, INC.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(7029) J. H. F. says: In looking over the SCIENTIFIC AMERICAN of May 30, 1896 (6869), I saw a formula to make a putty for picture frames. I made it by halving the formula, but find it is like rubber and does not get hard; what is the reason? I wanted to make a mould for the same, then, when hard, press some into, but could not get mould to harden. What shall I do? A. Picture frame composition.—Mix 14 pounds of glue, 7 pounds resin, ½ pound pitch, 2½ pints linseed oil, 5 pints of water, more or less according to the quantity required. Boil the whole together, well stirring until dissolved, add as much whiting as will render it of a hard consistency, then press it into a mould which has been previously oiled with sweet oil. No more should be mixed than can be used before it becomes sensibly hard. Gold size is then put on, several coats being considered necessary, then the gold leaf itself, which is burnished in course of time, and finally covered with finishing size. Make your moulds of plaster of Paris.

(7030) O. P. W. says: Will you please give me a receipt for a lacquer for brass? A. 1. Seed lac, dragon's blood, annatto, and gamboge, each 4 ounces; saffron, 1 ounce; alcohol, 10 pints. 2. Turmeric, 1 pound; annatto, 2 ounces; shellac and gum juniper, each 12 ounces; alcohol, 12 ounces. 3. Seed lac, 6 ounces; dragon's blood, 40 grains; amber and copal triturated in a mortar, 2 ounces; extract of red sanders, ½ drachm; Oriental saffron, 36 grains; coarsely powdered glass, 4 ounces; absolute alcohol, 40 ounces. Very fine. 4. Seed lac, 3 ounces; amber and gamboge, each 2 ounces; extract of red sanders, ½ drachm; dragon's blood, 1 drachm; saffron, ½ drachm; alcohol, 2 pints 4 ounces.

(7031) L. M. B. says: Will you please publish in your paper a formula for keeping the hair curled for a number of days and in damp weather? A. Use the liquid obtained by boiling, for ten minutes, 1 drachm quince seeds in ½ pint water and straining, or steep 6 ounces gum tragacanth for thirty hours in 1 gallon rose water, stirring frequently; strain through a cloth and let stand for a few days; then strain again and work into it 4 drachms oil of rose.

TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

November 10, 1896,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Air brake, F. L. Guillemet 571,115, 571,116
Air brake, H. F. Noyes 571,095
Air chamber, J. F. Reed 571,243
Alarm. See Burglar alarm.
Animal shears, J. K. Priest 571,241
Annealing metal castings, Evetts & Schurz 570,919
Annunciator, electric, J. Stamm 570,967
Automatic sprinkler, C. E. Buell 570,901
Axle box, W. J. McLean 571,235
Axle box lid, N. H. Davis 570,912
Axle box lid, car, A. O. Bucklus 571,299
Bag. See Mail bag.
Bag frame catch, A. Goertz 571,159
Band cutter and feeder, D. Harper 571,161
Band cutter and feeder, H. D. Myers 571,008
Bandage, C. A. Provoost 571,172
Battery. See Storage battery.
Bell, bicycle, J. R. Moore 570,944
Bell, signal, E. Olsen 571,013
Bicycle, L. De Rome 571,302
Bicycle, A. Pettinati 571,051
Bicycle, A. Warren 571,029
Bicycle alarm lock, J. P. Daniels 571,083
Bicycle bearing bracket, E. L. Shultz 571,289
Bicycle handle bars, removable cover for, E. M. & R. F. Spamer 571,025
Bicycle package carrier, G. J. Hise 571,132
Bicycle saddle, A. L. Garford 571,113
Bird cage, C. L. Johnson 571,165
Bit stock, J. W. Gray 571,267
Blackleading machine, Nicholas & Stephenson 571,199
Boiler. See Heating boiler. Locomotive boiler. Steam boiler.
Boiler furnace, S. S. Horner 570,995
Boiler furnace, S. P. Hutchinson 570,998
Boiler patch, C. J. Phillips 571,096
Book holder, J. T. Whitmore 571,254
Bottle, R. G. Bidwell 571,035
Bottle, antirefilling, W. A. Smith 571,204
Bottle collar, M. K. Hamilton 571,088
Bottle filling apparatus, Blumberg & Jacobson 571,104
Bottle, non-refillable, J. F. Kries 571,047
Bottle, non-refillable, O. J. Moussette 571,234
Bottle, nursing, W. L. Roth 571,245
Box. See Electric wall box. Fancy box.
Brake. See Air brake. Fluid pressure brake. Vehicle brake.
Brake, Kruse & Holstein 571,004
Bridge, concrete, A. Geisel 571,225
Broom or brush bridle, F. S. Hann 570,927
Bucket, coal C. Elbee 571,303
Burglar alarm, electric, C. Coleman 570,906
Button setting machine, E. D. Welton 571,207
Calcium carbid, composition of matter for manufacturing, H. Eldridge et al 571,084
Calculating machine, tax, J. L. Knight 571,070
Calendar, sheet, W. T. Wilson 571,031
Cane handling apparatus, A. A. Lorio 571,233
Cane, vehicle for hauling sugar, A. A. Lorio 571,309
Car bolster, metal, W. Case 570,979
Car brakes, slack adjuster for railway, M. J. Grier 570,925
Car coupling, F. D. Baker 570,976
Car coupling, J. J. Flynn 571,155
Car coupling, P. Hien 571,044
Car coupling, J. A. Hinson 571,229
Car coupling, M. L. Mardis 571,274
Car coupling, J. C. Taylor 571,251
Car coupling, M. I. Welch 571,030
Car draught iron, railway, W. Case 570,980
Car, dump, E. A. Trapp 571,058
Car fender, T. M. Miller 570,943
Car fender, I. N. Stanley 571,175
Car fender, unremitting rotary, Holloway & Starkweather 571,320
Car grain door, T. R. Parker 570,950
Car safety fender, street, J. W. Angell 571,256
Car sand depositing apparatus, J. Oldfield 571,136
Carriage attachment for lamps, M. F. Brigham 571,317
Carriage, folding, F. Heppner 571,228
Case. See Display case. Surgical instrument case. Traveling case.
Cash register, Sharpe & Banfield 571,098
Caster, furniture, M. Lachman 571,167
Cattle guard, automatic, S. L. Spencer 571,142
Cereals for food, machine for reducing and preparing, H. D. Perky 571,284
Cereals, machine for reducing, H. D. Perky 571,285
Chair. See Convertible chair.
Chiming mechanism, A. E. Olney 571,075
Churn, W. R. Cullison 571,039
Cigarette machine pasting mechanism, J. S. Beeman 571,061
Circuit breaker, automatic, W. H. Powell 571,097
Circuit closer, automatic safety, Pratt & Ripley 570,955
Cistern cleaner, J. A. McCawley 571,278
Clamp. See Pipe clamp.
Clamp joint, A. Edquist 571,042
Clock mechanism, calendar, T. W. R. McCabe 571,198
Cloth stretching machines, automatic clamp for, H. W. Butterworth 571,105
Coal crushing and breaking rolls, W. V. Culver 571,264
Coal shovel and ash sifter, combined, T. B. Sorenson 571,205
Cock, angle, T. A. Outhouse 571,201
Cocoa, preparing, G. A. Pieper 571,238
Coin holder, F. B. Wagner 571,179
Colter holder, F. M. Cook 571,189
Composition of matter, F. R. Hall 571,117
Convertible chair, L. A. Chichester 571,038
Corn husking machine feeder, J. Bauer, Jr 571,148
Cornstalk shredder and snapping machine, Tracy & Platt 571,057
Cornet, H. G. Neely 571,011
Counter attachment, sales, Walkinshaw & Kapp 571,252
Coupling. See Car coupling. Hose coupling.
Cultivating and clearing land, machinery for, T. Cooper 571,082
Cultivating implement, J. Darling 571,130
Cultivation of asparagus, C. A. von Maltzahn 571,273
Cultivator, E. Haiman et al 571,307
Cultivator, two row, S. L. Bailor 571,146
Current motor, M. G. Bunnell 571,063
Curtain fixture or support, G. W. Bamford 571,184
Cutter. See Band cutter.
Cycle, H. Brings 571,298
Dental operating chairs, chin rest for, J. F. Adams 571,209
Dental plugger, R. N. Stockton 571,176
Display case, bottle, A. J. Wallis 570,972
Divan, combination, P. B. Jackson 571,000
Door check, T. Curley 571,153
Door lock, hotel, C. W. Andrews 571,210
Doors, etc., apparatus for manufacturing, W. W. Grier 570,992
Draught regulator and spark arrester, combined, R. Deissler 570,985
Draught rigging, T. Eubank 570,987
Dressmaker's stand, A. L. Jones 570,931
Drill. See Ratchet drill. Rock drill.
Drilling or boring tool, B. & T. Wesselmann 571,253
Easel, T. Fillebrown 571,068
Easel support for books, etc., W. A. Holman 571,045
Electric light attachment, J. H. Rusby 571,248
Electric machine, dynamo, G. E. Dorman 570,914
Electric machine, dynamo, R. Lundell 571,310
Electric meter, Burger & McFall 571,036, 571,037
Electric meter, C. Wirt et al 571,032
Electric motor, G. R. Green 571,043
Electric switch, W. W. Hibbard 571,119
Electric wall box, W. F. Bossert 571,297
Electrical discharge device, C. B[illegible]kinner 571,099
Electrical distribution system, [illegible]ney & Kelly 571,300
Electrical distribution system, [illegible] & Cheney 571,270
Embroidery holder, [illegible] ..... 571,[illegible]
Embroidery holder, W. C. Maynard 570,940
End gate, wagon, B. T. Murphy 571,277
Engine. See Hydrocarbon or other engine. Internal combustion engine. Steam engine.
Engine, M. A. Yeakley 571,144
Evaporator, D. A. Quiggin 571,242
Exhauster, L. Schutte 571,022
Fancy box, H. & A. H. Stevenson 571,206
Fastenings, machine for making and driving metallic, Hamm & Eaton 571,227
Faucet, A. Clarke 571,065
Feed trough, E. J. Nason 571,280
Fence, J. T. Conover 571,150
Fence, Lee & Sawyer 571,049
Fence machine, J. D. Loving 570,938
Fence picket vise, F. A. Roseman 570,958
Fender. See Car fender. Car safety fender. Plow fender.
Fiber preparing machine, Radclyffe & Burrows 571,173
Filter, J. M. Davidson 570,910
Filtering and clarifying liquids, apparatus for, A. C. Newcomb 571,312
Fire escape, J. S. Crawford 570,908
Fire extinguisher, automatic, C. E. Buell 570,900
Fireproof door, door frame and window frame and shutter combination, T. Bailey 570,895
Fittings under pressure, means and construction for inserting, F. Sheridan 571,077
Fluid pressure brake, D. Dunn 570,915
Forceps, bone, A. De Vilbiss 571,040
Fruits, apparatus for treating dried, H. A. Turner, Jr 571,100
Furnace. See Boiler furnace. Metallurgical furnace. Reheating furnace. Smelting furnace. Steam furnace.
Furnace fuel feeder, W. Ruhl 571,139
Furnace grate, G. Dupmeyer 571,111
Furnaces, automatic reignition apparatus for hydrocarbon, A. Selgle 571,076
Fuse block, multiple, E. H. Montgomery 571,093
Gage. See Micrometer gage. Micrometer beam gage.
Game counter, J. Solatinow 571,174
Garment supporter, M. A. Farrington 571,222
Gas generating machine, J. A. Enos 571,221
Gas lighting device, electric, E. Schmidt 571,288
Gas, manufacturing, J. L. Janeway 571,269
Gas manufacturing apparatus, P. Brentini 571,062
Gas mixing apparatus, R. G. Kirkwood 571,196
Gate. See End gate.
Gate, H. G. Bowman 571,081
Gate, H. V. Philpott 571,237
Gate, Showalter & Carver 571,140
Gear, equalizing, C. C. Burton 571,187
Gearing, F. J. Woods 570,974
Generator. See Magneto generator.
Glass articles while being finished, clutch for holding, W. J. Wilkinson 571,255
Gluing machine, shuck, W. F. Hutchinson 571,321
Grain binder, L. Miller 571,072
Grain drill speed gearing, R. Galloway 571,224
Grain drying apparatus, T. G. Frost 570,989
Grater, nutmeg, C. E. Damon 571,218
Grave lining, J. A. Knarr 571,090
Grease-proofing articles, compound for, Shober & Ullmann 570,965
Grinding machine, knife, Snow & Sherman 570,966
Harness attachment, W. A. Seibel 570,934
Harrow, Jackson & Rhegness 571,164
Harvester, corn, C. Schulze 571,202
Harvester, grain binding, L. Miller 571,073
Heater, E. C. Hall 570,993
Heater, J. Mahedy 571,135
Heating apparatus, electric, A. E. Appleyard 571,257
Heating boiler, E. A. Wood 571,208
Heel nailing machine, C. W. Glidden 571,087
Helmet, smoke, C. G. M. Reichel 571,018
Hinge, couch or bed, A. Huttinger 571,194
Hinge, spring, H. A. Hoffman 571,133
Hoisting and stone laying apparatus, G. Hunter 571,122
Hose coupling, R. W. Burkhardt 571,212
Hose machine, R. T. Burchell 571,261
Hose nozzle, C. Callahan 570,903
Hose nozzle, J. J. Ledden 571,048
Hydraulic or other engine, J. E. Schumacher 571,129
Ice, apparatus for manufacturing, W. F. Singer 571,141
Ice cream mould, R. L. Prange 571,171
Ice cream mould and dipper, F. D. Clark 571,188
Ice cream mould and disher, H. J. Pfeiffer 571,170
Indicator. See Station indicator.
Inkstand, J. W. Jacobus 571,046
Ink well, E. Rudolph 570,959
Internal combustion engine, C. W. Pinkney 571,233
Iron, electrolysis of, A. S. Ramage 570,956
Ironing table, J. H. Foster 571,158
Jack. See Wagon jack.
Joint. See Clamp joint.
Joints, repair device for stopping leaky, S. R. Dresser 571,220
Key. See Time recorder key.
Ladder, extension, J. F. Mack 570,939
Lamp chimney protector, A. Doherty, Jr 571,131
Lamp, electric, R. M. Hunter 571,123
Lamp, electric arc, H. R. Palmer 571,137
Lamp, gas, J. F. McElroy 571,311
Lamp globe, Ballou & Seaver 570,896
Lamp, street, C. R. Lindsay, Jr 571,005
Lather cutting machine, A. L. Sweet 571,292
Leather for forming pockets, machine for splitting, A. L. Sweet 571,291
Leather loop finishing machine, A. L. Sweet 571,294
Leather slitting machine, A. L. Sweet 571,295
Leather trimming machine, A. L. Sweet 571,293
Lift or hoist for warehouses, H. F. Donaldson 570,913
Lighting, heating and cooking, apparatus for, J. G. Pennycuick 571,014
Locomotive boiler, C. O. Heggem 571,118
Locomotive draught regulator, Degener & Deissler 570,983
Locomotive, electric, J. F. McLaughlin 570,945
Loom, L. Heer 571,122
Loom, E. von Oberleithner 571,236
Loom harness frame, H. W. Hakes 570,926
Loom reed, J. Adamson 571,182
Loop forming and pressing machine, A. L. Sweet 571,290
Lounge, E. E. Rueter 571,247
Magnet pole, field, J. J. Wood 571,181
Magneto generator, J. C. Francis 571,305
Mail bag, F. L. Boynton 570,899
Match, J. W. Denmead 571,154
Match box sbucks, machine for making and sanding, H. W. Whelan 571,180
Match safe, Huebel & Manger 571,121
Mattresses, register for folding, H. S. McCormick 571,009
Measuring device, liquid, G. W. Curtis 571,217
Metal planing machines, automatic feed stop for, A. M. Powell 570,954
Metal planing machines, feed operator for, A. M. Powell 570,953
Metals under pressure, apparatus for treating heated, G. A. Dick 571,265
Metallurgical furnace, B. Talbot 571,250
Meter. See Electric meter.
Micrometer beam gage, J. J. McIntyre 571,094
Micrometer gage, G. Thompson 571,178
Mining machine, Boland & Fritz 571,259
Mitten, bicycle, T. H. Royce 571,020
Mould pattern, collapsible and adjustable, M. A. Baker 571,060
Mop, H. Rowlands 571,246
Motion, device for converting, W. E. Watkins 571,296
Motor. See Current motor. Electric motor.
Music box damper, F. J. Bernard 570,898
Net lifting machine, W. F. Abearn 571,033
Nut lock, O. S. Ebert 571,066
Nut lock, S. A. Eisele 570,917
Nut lock, C. T. Redfield 571,286
Nut lock, axle, O. S. Ebert 571,067
Nut wrench, axle, T. G. Clifford 571,214
Nut wrench, axle, W. E. Kleckner 570,933
Ores, etc., apparatus for compressing and agglomerating roasted, J. W. Neill 570,947
Package, airtight, M. Falk 571,112
Paint compound, C. V. Petraeus 571,128
Paper machine, F. P. Nicely 570,949
Pencil and penholder, combined, J. D. Kious 570,932
Pencil point protector, combination, C. S. Freer 570,922
Photographic dark room, portable, W. T. Ferguson 571,085
Photographic prints, forming, Sampolo & Brasseur 571,314
Piano, W. A. Byrne 571,106
Piano, electrical self playing, G. H. Davis 570,911
Piano, grand, J. Herrburger 571,163
Pin. See Safety pin.
Pincushion, J. McCartney 571,169
Pipe clamp, F. Anderson 570,975
Pipe coupling device, automatic, W. E. Crowson 571,216
Pipe fitter's combination tool, Kritcher & Weinstein 570,934
Pistol, recoil magazine, H. Borchardt 571,260
Planting machine, W. E. Cheeseman 570,905
Pliers, parallel jaw, A. Schatz 571,021
Plow fender, A. G. W. Foster 571,223
Powder distributer, C. M. Arthur 571,145
Powder papers, holder for, C. Dickinson 571,041
Power. See Pump power.
Printer's chase, Harding & Osborn 570,928
Printing attachment for letter boxes, B. L. Hargrove 570,994
Printing attachment for [illegible] work, G. P. Van Wye ..... [illegible]
Printing press, B. Huber 571,089
Projectile, armor piercing, I. G. Johnson 571,195
Propulsion of vessels, J. H. Mosley 571,127
Pulley, wood, H. C. Crowell 570,909
Pulping apparatus, C. W. Roberts 571,019
Pump power, Fulton & Ames 571,086
Pump regulator, automatic, J. C. Sterns 570,968
Puzzle, W. F. Feldhoff 570,921
Rail chair, W. Campbell 571,064
Railway cross tie, A. Bidwell 571,316
Railway crossing, D. Collen 571,215
Railway crossings, electrically controlled derails for, J. P. Coleman 571,107
Railway signal, W. D. Hartz 571,191
Railway street sprinkler, J. R. & J. B. Gathright 570,990, 570,991
Railway switches, device for operating, J. A. Marsh 571,006
Railway switching apparatus, A. E. Finley 570,988
Ratchet drill, M. M. Watkins 570,973
Recorder. See Time recorder.
Recording output of machinery, apparatus for, P. Dillon 571,110
Reel. See Wire reel.
Register. See Cash register.
Reheating furnace, W. H. Bailey 571,258
Rim lock, W. H. Taylor 571,027
Rivet, J. Temler 571,177
Rock drill, L. H. Jenkins 571,231
Rods or bars, apparatus for treating, G. H. Geyer 571,306
Roller mill adjustment, M. Favrow 571,266
Roof truss, O. J. Stouffer 571,055
Rubber working machine, F. Hadfield 571,226
Rule miter gage attachment, F. Reissmann 571,052
Safety pin, A. T. Snell 571,054
Sash weights, flask for making seamless, A. S. Hodges 571,308
Saw, J. Oldham 571,200
Saw sharpening machine, Holley & Rawlings 570,929
Scale pan, G. S. Forschner 571,157
Seal lock, D. Comfort 570,907
Seal lock, W. P. Huntley, Jr 571,230
Sealing device, bottle, A. M. Cowart 571,262
Seed, means for treating, B. Reeve 571 017
Sewing machine, H. H. Buffum 5,0,902
Sewing machine, J. F. Hardy 571,318
Sewing machine, F. A. Mills 571,007
Sewing machine, W. D. Rundlett ..... 570,960 to 570,962
Sewing machine, Scetrini & Bridger 571,053
Sewing machine, D. W. Stevenson 570,969
Sewing machine, overedge, H. A. Klemm 571,125, 571,322
Sewing machine spool holder, L. E. Smith 571,024
Sewing machine table, N. A. Hull 571,193
Sewing machines, hair dividing attachment for overedge, H. A. Klemm 571,126, 571,323
Shaft, vehicle, P. F. Chambers 571,213
Shearing or cutting tool, combined, R. M. Hunter 570,930
Shears. See Animal shears.
Shears, P. Haase 571,160
Shelving, library, G. Stikeman 571,249
Shoe pull, G. Muller 571,276
Shoes, lacing strip for laced, J. Sabine 570,963
Shore or bank protector and method of and apparatus for constructing and placing same, D. Neale 570,946
Sieve, flour mill, J. Denis 571,219
Signal. See Railway signal.
Signaling apparatus, fog, D. Slade 571,203
Signaling apparatus, pneumatic, F. Schieffler 571,315
Sling trip, Nadler & Le Blanc 571,074
Smelting furnace, H. Charlier 570,981
Soap reservoir, liquid, E. Lee 570,935
Spark arrester and draught regulator, combined, R. Deissler 570,984
Spindle, H. E. Hughes 570,996, 570,997
Spinning frame, ring, S. H. Dubois 570,986
Sprinkler. See Automatic sprinkler. Railway street sprinkler.
Sprinkler, C. Neracher 571,012
Stand. See Dressmaker's stand.
Starching machine, D. H. Newton 571,281
Station indicator, D. E. Conner 571,301
Steam and explosion engine, combined, W. Barnsdale 571,147
Steam boiler, H. S. Pell 571,282
Steam engine, J. Barton 571,034
Steam furnace, Hutchinson & Wiegand 570,999
Steam generators, means for closing tubes of, N. W. Pratt 571,016
Stock guard, J. M. Lee 571,232
Stoker, underfeed, A. F. Brown 570,978
Stoker, underfeed, D. F. Graham 570,924
Storage battery, electric, T. W. Allan 571,059
Stove, gas or oil, S. L. Richards 570,957
Stove lid, G. B. Littlefield 570,937
Street sweeper, M. B. Atkinson 571,183
Stubble rejector, H. Pearson 571,138
Sulky, E. S. Keeler 571,003
Surgical instrument case, E. Lee 570,936
Suspenders, H. P. Geisler 571,114
Switch. See Electric switch. Telephone switch.
Table. See Ironing table.
Table, E. E. Bennett 570,897
Tablet machine for stenographers' use, M. P. Bonebrake 571,149
Teeth, support and carrier for artificial, H. D. Justi 571,166
Telephone, magneto, E. M. & W. S. Harrison 571,190
Telephone switch, E. M. Harrison 571,162
Thermometer, oven, L. S. Barndollar 571,211
Time recorder, employee's, E. W. Lindenau 571,272
Time recorder key, E. G. Heene 571,268
Tin and terne plates, machine for polishing, N. D. Lewis 571,071
Tires, automatic pump for pneumatic, T. M. Jenks 571,001
Tires, repair plug for pneumatic, D. W. Colbapp ..... 571,[illegible]
Tool, combination, J. F. Ryder 571,287
Tool fishing apparatus, G. L. McKain 571,279
Tool holder, C. E. Goodspeed 570,923
Tooth crowns, mould for shaping metallic, L. L. White 571,102
Toy and advertising machine, mechanical, C. S. Pocock 571,015
Traveling case, O. P. Hurd 571,124
Triangle and protractor, combined, W. J. Belcher 570,977
Trolley, electric railway, H. D. Hinckley 571,120
Trolley, electric railway, P. C. Macevoy 571,092
Trough. See Feed trough.
Truck, car, T. Crawford 571,263
Truck, street car, T. H. Lovejoy 571,091
Trunk, G. Crouch 571,152
Tube punctures, device for closing, W. B. Merritt 570,941, 570,942
Tug, thill, W. R. Chapin 570,904
Typewriting machine, W. K. Jenne 571,002
Undergarment, A. G. Velasko 570,971
Urinal guard or screen, Maxwell & Gorman 571,275
Valve, closet cistern, J. L. Mott, Jr 571,168
Valve, steam stop, R. & W. McLaughlin 571,010
Vehicle brake, I. W. Price 571,240
Vehicle, self propelling, R. H. Plass 570,952
Valve, tank supply, W. Scott 571,022
Vehicles, evener for two horse, J. Hook, Jr 571,134
Velocipede, E. Humbrecht 571,069
Velocipede lamp bracket, R. C. Whayne 571,101
Velocipede working mechanism, B. Ljungstrom 571,197
Veterinary tooth cutter, T. J. Pence 571,283
Wagon jack, J. J. Adgate 571,078
Washing machine, J. H. Estes 571,304
Water closet, J. C. Reed 571,244
Water closet bowls, venting device for, C. H. Cook 570,982
Water closet, siphon, E. C. Stover 571,026
Water wheel, Pascault & De Coursac 570,951
Wheel. See Water wheel. Wind wheel.
Wheel measure, A. E. Remus 571,313
Wheels, detent for ratchet, W. D. Marks 571,050
Wheels, machine for making rims for pneumatic, J. Banwell 571,080
Whist apparatus, duplicate, R. M. Bent 571 185
Wind wheel, J. L. Thompson 571,056
Window, O. M. Edwards 570,916
Window, J. Endres 570,918
Window, M. W. Neuens 570,948
Wire fabric machine, W. C. Avery 571,079
Wire fastener, J. C. Kremer 571,271
Wire reel, C. H. Faut 570,920
Wire reel, F. Forsberg 571,156
Woodworking machine, D. Bullock 571,186
Wrench. See Nut wrench.
Yarn testing machine, M. H. Tomkins 570,970

DESIGNS.

Bicycle frame, E. N. Gates 26,263
Brush back or similar article, W. C. Codman 26,250
Erasing plate, V. Copland 26,251
Fire extinguishers, distributer for, W. Esty 26,254
Fire extinguishers, yoke for automatic, W. Esty 26,255
Hammock support, I. E. Palmer 26,258
Hook, garment, E. T. & F. A. Smith 26,259
Match box, A. N. Clark 26,252
Sprinkler, W. Esty 26,253
Stove, cooking, H. W. Beattie 26,262
Stove shelf section, H. W. Beattie 26,261
Tack, curtain, C. M. Numan 26,260
Valve support, W. Esty 26,256

TRADE MARKS.

Kentora Brewery Company 29,142
Bicycles and tricycles, E. B. Wilcox 29,154
Billiard and pool balls, Albany Billiard Ball Company 29,149
Boots and shoes, Rice & Hutchins 29,121
Cement for rubber goods, especially for bicycle tires, J. E. McWilliam 29,137
Cocoa, H. Maillard 29,143
Corsets, Weingarten Brothers ..... 29,123 to 29,125
Cotton goods, such as bedspreads, bedquilts, counterpanes, and other Jacquard woven goods, except towelings, Monadnock Mills 29,128
Crackers, wafers, and malt extracts, Potter & Wrightington 29,140
Cycles, velocipedes, bicycles and tricycles, J. Aucoc et Darracq 29,153
Dolls, kid body bisque head, Firm of J. D. Kestner, Jr 29,129
Electrical apparatus, certain named, Chemisch-Elektrische Fabrik "Prometheus" Gesellschaft mit Beschrankter Haftung 29,150
Embalming fluids, Embalmers' Supply Company 29,130
Flour, wheat, Pearl Roller Mill Company 29,147
Garments, ready made, M. B. Brummer 29,126
Graphite and its products, United States Graphite Company 29,138
Guns, shot, Winchester Repeating Arms Company 29,156
Italian cloths, serges, silks, velvets, bindings, braids and linings, Lesber, Whitman & Company 29,127
Kola and malt for foods and beverages, compounds of, Thomson & Taylor Spice Company 29,141
Lactate of silver, citrate of silver, and all pharmaceutical preparations of silver, Chemische Fabrik von Heyden, Gesellschaft, mit Beschrankter Haftung 29,133
Lamps, fixtures for incandescent gas, L. Hartman 29,152
Lamps, gas fixtures for incandescent gas, L. Hartman 29,151
Ledgers, assessment and tax, S. R. Fairchild 29,115
Lozenges and other confectionery, Smith & Peters 29,139
Oil, olive, F. Romeo & Company 29,145
Pasteboard and boxes, cases, wrappers, envelops, and other articles manufactured therefrom, Thompson & Norris Company 29,117
Pens, L. Dreka 29,114
Plastic cementitious material, compressible tubular bolders for, Boston Woven Hose and Rubber Company 29,155
Remedies for common and simple disorders, Hance Brothers & White 29,131
Saccharine compounds, artificial, Chemische Fabrik von Heyden, Gesellschaft, mit Beschrankter Haftung 29,146
Saponaceous and alkali solutions to be mixed with soap and water for cleaning purposes, E. Burst 29,136
Shoes, Jones Shoe Manufacturing Company 29,118
Shoes, Pingree & Smith 29 119
Shoes, women's, Hamilton, Brown Shoe Company 29,120
Soda and silicate of soda, caustic, Joseph Crosfield & Sons 29,134, 29,135
Sole and heel protectors, North & Judd Manufacturing Company 29,122
Tablets for colds and hay fever, also a tonic and disinfectant, W. C. Kloman 29,132
Tea, coffee, spices, baking powder, flavoring extracts, soap and starch, Jones Brothers 29.144
Tickets or contracts, coupon, Inter-State Casualty Company, of New York 29,116
Tobies, S. Ewart & Company 29,148
Tools, holders for sharpening, T. A. Lamotte 29,257

PRINTS.

"A Gallery of Celebrities," United States Playing Card Company 35

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 10 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York. Special rates will be given where a large number of copies are desired at one time.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

© 1896 SCIENTIFIC AMERICAN, INC.

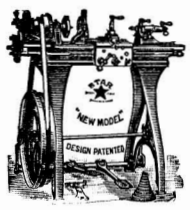
Advertisements.

ORDINARY RATES.

Inside Page, each insertion - - 75 cents a line
Back Page, each insertion - - - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

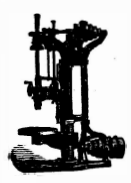


Star ★ Lathes Foot power Screw... ...cutting Automatic Cross feed
9 and 11-inch Swing.
New and Original Features
Send for Catalogue B.
Seneca Falls Mfg. Company,
695 Water St., Seneca Falls, N.Y

VELOCITY OF ICE BOATS. A COLlection of interesting letters to the editor of the SCIENTIFIC AMERICAN on the question of the speed of ice boats, demonstrating how and why it is that these craft sail faster than the wind which propels them. Illustrated with 10 explanatory diagrams. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **214**. Price 10 cents. To be had at this office and from all newsdealers.

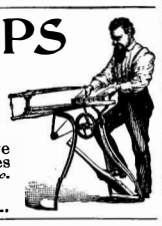
POWER & FOOT LATHES. SHAPERS, PLANERS, DRILLS, MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES. CATALOGUE FREE
SEBASTIAN LATHE CO. 120 CULVERT ST. CINCINNATI, O.

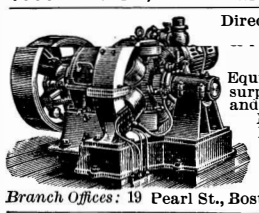
POOR CLAIMS MADE PROFITABLE
The immense saving effected by the use of our
PERFECTED STEAM STAMP for crushing ores has in many instances made the above statement a reality. Prospectors and mining capitalists investigate. Nothing like them in all Christendom. Write
CATES IRON WORKS, CHICAGO.



Upright Drills
and General Line of Machine Shop Tools.
HILL, CLARKE & CO.
160 Oliver Street, BOSTON.
16 S. Canal St., Chicago.

WORK SHOPS
of Wood and Metal Workers, without steam power, equipped with
BARNES' FOOT POWER MACHINERY
allow lower bids on jobs, and give greater profit on the work. Machines sent on trial if desired. *Catalog Free.*
W. F. & JOHN BARNES CO.
1999 RUBY ST., ROCKFORD, ILL.





Direct Coupled Engines and Dynamos for
LIGHT PLANTS
Equipment complete and unsurpassed. Electric Motors and Dynamos, Bipolar and Multipolar. ⅛ to 150 h. p. For particulars, address
BELKNAP MOTOR CO.
HOME OFFICE,
Portland, Me., U. S. A.
Branch Offices: 19 Pearl St., Boston. Thames Bldg., N.Y

ACETYLENE APPARATUS.—ACETYlene number of the SCIENTIFIC AMERICAN SUPPLEMENT, describing, with full illustrations, the most recent, simple, or home made and commercial apparatus for generating acetylene on the large and small scale. The gas as made for and used by the microscopist and student; its use in the magic lantern. The new French table lamp making its own acetylene. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1057**. Price 10 cents. To be had at office.

THE COBURN PATENT TROLLEY TRACK
HOUSE DOOR HANGERS

The first made with adjustable track.
The track can be put up in 30 minutes.
☞ *Send for Book.*
The Coburn Trolley Track Mfg. Co., Holyoke, Mass.

A Boiler Feeder For High Pressures
WORKS AT 150 TO 250 LBS. STEAM
as easily as
OUR STOCK INJECTOR AT 25 TO 150 LBS.
May we tell you about it?
PENBERTHY INJECTOR CO.,
116 Seventh Street, DETROIT, MICH.

HARVEY HUBBELL
Machinery and Tool Mfr.
Improved Tapping Machines
SCREWS
Machine Screws for electrical purposes.
Sample box free.
BRIDGEPORT, CONN.

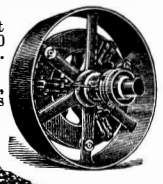
ELECTRO MOTOR. SIMPLE. HOW TO make. By G. M. Hopkins.—Description of a small electro motor devised and constructed with a view to assisting amateurs to make a motor which might be driven with advantage by a current derived from a battery, and which would have sufficient power to operate a foot lathe or any machine requiring not over one man power. With 11 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **641**. Price 10 cents. To be had at this office and from all newsdealers.

DEFIANCE MACHINE WORKS
DEFIANCE, OHIO, U.S.A.
BUILDERS OF
HUB, SPOKE, WHEEL, BENDING, WAGON, CARRIAGE AND HOOP MACHINERY.
SEND FOR CATALOGUE.

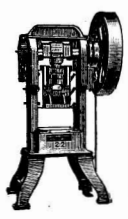
You Want to Learn
all about mechanics—about tools and their many uses? Then read "A BOOK OF TOOLS"

A BOOK OF TOOLS is the most complete catalogue ever issued. 550 pages and over 2,000 illustrations. Prices are given.

A copy of this book sent, postpaid, to any address on receipt of 25 cents in stamps.



CHAS. A. STRELINGER & CO.
Address Box 12½, Adv. Dept. DETROIT, MICH.



POWER PRESSES
for the manufacture of
HARDWARE SPECIALTIES,
Spoons, Buttons, Locks, Shovels, etc.
for all operations in the manufacture of Metal Goods. Improved Clutch Relief, no Clicking, Presses changed to order to suit any special requirements. Send us full particulars, stating what you wish to make. Machines fitted with Automatic Feed and Ejectors.
F. S. & G. L. BROWN,
27-29 Fort Ave., Baltimore, Md.

TO BUSINESS MEN
The value of the SCIENTIFIC AMERICAN as an advertising medium cannot be overestimated. Its circulation is many times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading rooms of the world. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. This he has when he advertises in the SCIENTIFIC AMERICAN. And do not let the advertising agent influence you to substitute some other paper for the SCIENTIFIC AMERICAN when selecting a list of publications in which you decide it is for your interest to advertise. This is frequently done for the reason that the agent gets a larger commission from the papers having a small circulation than is allowed on the SCIENTIFIC AMERICAN.
For rates address
MUNN & CO., Publishers,
361 Broadway, New York.

Wire Forming Machines
With **F. B. Manville's Patent Sliding Former.** Articles made from coil of round, flat or square wire, same as shown in the cut.
☞ Bent Wire Goods furnished to order.
BLAKE & JOHNSON,
P. O. Box 7, Waterbury, Conn., U. S. A.

WIRE Machinery for making any articles from **WIRE**
Automatic wire forming machine department is in Machinery for making sheet metal goods.
THE WATERBURY MACHINE CO.,
P. O. Box 1025,
WATERBURY, CONN., U. S. A.

WATER FOR COUNTRY USE.
THE DOMESTIC PUMP.
A wonderful invention for Raising Water. The WINDMILL'S GREATEST RIVAL. For Country Homes, Hotels and Summer Resorts. Call and see it in practical operation. Send for Catalogue and testimonials of well-known Milwaukee people.
THE ERWIN HYDRAULIC MACHINERY CO.,
58 & 59 Loan & Trust Bldg., Milwaukee, Wis.

The "Knapp" Electric Motor By Mail

Best at the price. Does wonderful work. Fitted with pulley for running toys, etc. Packed in box with four inch fan and battery elements to put in tumbler, with full directions. ☞ *Send stamp for circular of larger motors and other novelties.*
$1
KNAPP ELECTRIC & NOVELTY CO., 45 Warren St., N.Y

WILL YOU START A LAUNDRY?
"The Columbia"
Modern Laundry Machinery
Is the Cheapest and Best.
WILSON LAUNDRY MACHINERY COMPANY,
Send for Catalog S. A. Columbia, Pa.

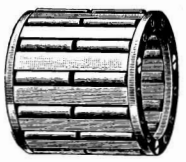
DO YOU USE GRINDSTONES?
If so, we can supply you. All sizes mounted and unmounted, always kept in stock. Remember, we make a specialty of selecting stones for all special purposes. ☞ *Ask for catalogue.*
The CLEVELAND STONE CO.
2d Floor, Wilshire, Cleveland, O.

If you want the best Lathe and Drill

CHUCKS
BUY WESTCOTT'S.
Strongest Grip, Greatest Capacity and Durability, Cheap and Accurate.
Westcott Chuck Co., Oneida, N. Y., U. S. A.
Ask for catalogue in English, French, Spanish or German.
FIRST PRIZE AT COLUMBIAN EXPOSITION, 1893.

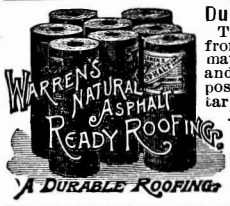
BUY TELEPHONES
That Are Good--Not Cheap Things
The Lynchburg, Va., Telephone Co. tried to get success out of other apparatus and were put to large losses until a change was made to the "Western," 500 capacity of the latter being now operated there at a profit.
Hundreds of similar cases may be cited affecting the apparatus of nearly all so-called competitors.
WESTERN TELEPHONE CONSTRUCTION CO.
250 South Clinton Street, Chicago
The Largest Manufacturers of Telephones in the U. S.

FOR ALL SHAFT SIZES. **Hub Roller Bearings**



NO WEAR. NO FRICTION.
Rolls Accurately Guided in Parallel Lines.
They Save Power, Oil, Time.
They are the Best! Try them!
Write for Prices,
The Ball Bearing Co.
12 Watson St., Boston, Mass.

ROCK DRILLS
AIR COMPRESSORS
SIMPLEST, MOST EFFICIENT and DURABLE.
RAND DRILL CO.
Send for Catalogue. 100 Broadway, New York.



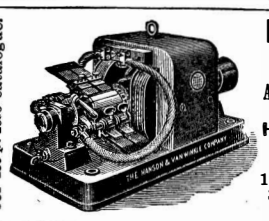
Durable—Easily Applied.
This roofing is manufactured from natural Trinidad asphalt materials, and will not dry up and become brittle under exposure to the weather as coal-tar roofings do. ☞ *Send for free sample of roof 12 years old, with circular and price list to*
WARREN CHEMICAL & MFG. CO.,
85 Fulton Street, New York, U. S. A.

THE MODERN ICE YACHT. — BY Geo. W. Polk. A new and valuable paper, containing full, practical directions and specifications for the construction of the fastest and best kinds of Ice Yachts of the latest, most approved forms. Illustrated with engravings drawn to scale, showing the form, position, and arrangement of all the parts. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **624**. Price 10 cents. To be had at this office and of all newsdealers.

SMALL MOTORS for All Purposes.

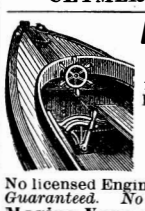
The best manufactured. Specially adapted for all kinds of work, sewing machine outfits toys, dentists' drills, jewelers' lathes, models, etc. Send for Catalogue. The LEAVITT MOTOR Manufacturers of Electric Motors and Electrical Specialties, 122 PROVIDENCE, R. I.

Send your business card for 150 p. 1896 catalogue.



NICKEL AND **Electro-Plating**
Apparatus and Material.
THE Hanson & VanWinkle Co.,
Newark, N. J.
136 Liberty St., N. Y.
35 & 37 S. Canal St., Chicago.

ELECTRICAL SUPPLIES
AT MANUFACTURERS' PRICES.
Medical Battery, Finely Finished,
3 Currents, $3.25. Guaranteed.
CLYMER & HEILMAN, Reading, Pa.



ALCO VAPOR LAUNCH
Engine and Helm Controlled from Bow
Latest improved and only 12 to 1 Motor now ready for the market. 18 to 40 ft. Launches, 2, 3, 5 and 7 horse power.

No licensed Engineer or Pilot required. *Speed and Safety Guaranteed. No Dangerous Naphtha or Gasoline used.*
Marine Vapor Engine Co., Jersey City, N. J.

SCIENTIFIC AMERICAN SUPPLEMENT. Any desired back number of the SCIENTIFIC AMERICAN SUPPLEMENT can be had at this office for 10 cents. Also to be had of newsdealers in all parts of the country.

PERFORATED METAL
OF EVERY DESCRIPTION AND FOR ALL USES
THE HARRINGTON & KING PERFORATING CO.
225 NORTH UNION ST. CHICAGO ILL. U.S.A.
AND 284 PEARL ST. NEW YORK

How to Build a Home

Those intending to build will find the very best practical suggestions and examples of Modern Architecture in the handsomest Architectural Magazine ever published . .

"The Scientific American Building Edition."

Each number is illustrated with a *Colored* plate and numerous handsome engravings made *direct from photographs of buildings*, together with interior views, floor plans, description, cost, location, owners' and architects' names and addresses. The illustrations include seashore, southern, colonial and city residences, churches, schools, public buildings, stables, carriage houses, etc.

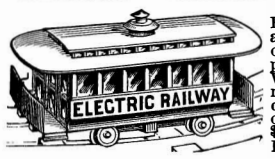
All who contemplate building, or improving homes or structures of any kind, have in this handsome work an almost endless series of the latest and best examples from which to make selections, thus saving time and money.

PUBLISHED MONTHLY. SUBSCRIPTIONS $2.50 A YEAR. SINGLE COPIES 25 CENTS.
For sale at all news stands, or address MUNN & CO., Publishers, 361 Broadway, New York

Electricity Taught by Mail
Mechanics; Mechanical and Architectural Drawing; Plumbing; Architecture; Mining; Civil Engineering in all Branches; Steam Engineering (Stat'y., Loco. and Marine).
The International Correspondence Schools
To Electrical ....Workers,
Machinists, Miners, Plumbers, Civil Engineers, Draughtsmen, Carpenters, Steam Engineers, Steam Fitters. *References. Free Apparatus. Send for Circular, Stating Subject you wish to Study.*
B 942, Scranton, Pa.

EDGE TOOLS-

are often nearly ruined by using a grindstone not adapted to the work. Our quarries produce a large variety of grits suitable for grinding any tool.
☞ *May we send you our Catalogue, which will give you some information?*
GRAFTON STONE COMPANY,
No. 80 River Street, Grafton, Ohio.



Complete Electric Railway, with battery and track. Car made of polished brass. A perfect working model Weight 5 pounds. Will run nine miles on one quart solution. Sent on receipt of price, $3.00. CARLISLE & FINCH, Cincinnati, O.

DROP FORGINGS
WYMAN & GORDON
WORCESTER, MASS.
28 BRADLEY STREET.

GREAT REDUCTION IN
RUSSIAN PATENTS
NEW LAW NOW IN FORCE.
On the 13th of July, a new Russian patent law went into effect, reducing the cost of obtaining the patent and increasing the term to 15 years. We can now procure a Russian patent for $125 in ordinary cases. The price formerly was from $200 to $450 for a patent of from 3 to 10 years. Annual taxes will be payable.
Patents granted under the old law may, if still in force, be extended to the full term of 15 years, counting from the original date, by paying all the annuities that would have become due if the new law had been in operation at the time the application was filed.
For full particulars address,
MUNN & CO., 361 Broadway, New York.

MEWER AUTOMATIC FEED DRILL.

An indispensable Labor Saver.
Will feed, fine or coarse, at any angle, without pressure or loss of power. Warranted.
For particulars, prices, etc.,
MEWER TOOL CO.,
16 Elm St., Portland, Me., U. S. A.

BEST DRYING MACHINES
for Grain, Sand, Clays, Fertilizers, Green Coffee, Wet Feeds, Salt, etc. See illustrated article in SCI. AM., October 24, '96. 15 Years in operation. ☞ *Send for 6th illustrated catalogue.*
S. E. WORRELL, Hannibal, Mo.

THE MANUFACTURE OF MATCHES. —An interesting and popular description of the method of manufacturing sulphur and safety matches as practiced in France. With 10 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1013**. Price 10 cents. To be had at this office and from all newsdealers.

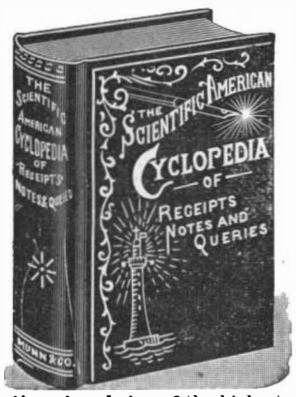
MODELS & GEARS EXPERIMENTAL WORK CATALOGUES FREE UNION MODEL WORKS CHICAGO

Twelfth Edition Now Ready.

THE SCIENTIFIC AMERICAN CYCLOPEDIA OF Receipts, Notes and Queries

12,500 RECEIPTS. 708 PAGES.

Price, $5.00 in Cloth; $6.00 in Sheep; $6.50 in Half Morocco, Postpaid.



THIS great work has now been on the market for nearly six years, and the demand for it has been so great that twelve editions have been called for.
It is entirely distinct from the ordinary receipt book in being thoroughly up to date.
The work may be regarded as the product of the studies and practical experience of the ablest chemists and workers in all parts of the world; the information given being of the highest value, arranged and condensed in concise form, convenient for ready use. Almost every inquiry that can be thought of, relating to formulæ used in the various manufacturing industries, will here be found answered.
Those who are engaged in almost any branch of industry will find in this book much that is of practical value in their respective callings. Those who are in search of independent business or employment, relating to the home manufacture of salable articles, will find in it hundreds of most excellent suggestions.
☞ *Send for descriptive circular.*
MUNN & CO., Publishers,
361 Broadway, New York.

HYPNOTISM Sixty ways, $5; my method, $2. 100 page book, 10c. Occult Forces, 30c. Prof. Anderson, S. A. 116, Masonic Temple, Chicago

© 1896 SCIENTIFIC AMERICAN, INC.

AN INVIGORATING BATH

is the best preservative of health, and the best bath of all for this purpose is the

IMPROVED HOME TURKO-RUSSIAN FOLDING BATH CABINET.

Portable—can be used in any room. Dry steam, vapor oxygen, medicated and perfumed baths. Sure cure for rheumatism and colds. Insures a clear complexion. Prevents obesity.

☞ *Send for descriptive circular.*

MAYOR, LANE & CO., 121 White Street, New York City.

The Scientific American Reference Book.

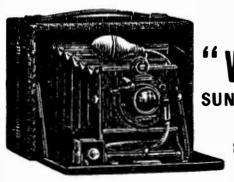
A most useful little bound book of 150 pages, comprising, probably, the most extensive variety of standard, practical, condensed information ever furnished to the public for so small a price, only 25 cents.

Among its contents are: The Last Census of the United States (1890), by States, Territories, and Counties; Table of Cities having over 8,000 inhabitants; Map of the United States—miniature outline; The Patent Laws full text); The Trade Mark Law (full text); The Copyright Law (full text); The Principal Mechanical Movements—illustrated by 150 small diagrams—of value to inventors and designers of mechanism; Medallion Portraits of Distinguished American Inventors; Valuable Tables relating to Steam, Electricity, Heat, Metals, Weights, and Measures.

☞ *Sent by mail to any address on receipt of price,* **25 cents.**

MUNN & CO., Publishers,
361 Broadway, New York.

ONLY PRACTICAL MAGAZINE CAMERA.



SUNART'S "VENI, VIDI VICI,"

SUNART MAGAZINE, SUNART FOLDINGS

Send for Illustrated Catalogue—2 cent stamp.

SUNART PHOTO CO., ROCHESTER, N. Y.

CROOKES TUBES AND ROENTGEN'S Photography.—The new photography as performed by the use of Crookes tubes as a source of excitation. All about Crookes tubes. SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **181, 189, 238, 243, 244, 792, 795, 905, 980, 1050, 1054, 1055, 1056, 1057,** also SCIENTIFIC AMERICAN, Nos. **7, 8, 10** and **14,** vol. 74. These profusely illustrated SUPPLEMENTS contain a most exhaustive series of articles on Crookes tubes and the experiments performed with them. Among them will be found Prof. Crookes' early lectures, detailing very fully the experiments which so excited the world, and which are now again exciting attention in connection with Roentgen's photography. Price 10 cents each To be had at this office and from all newsdealers.

They have a tone that's all their own . . . . .

THE NEW DEPARTURE BELLS are the standard of excellence the world over. Made in 16 different styles and prices. Send postal for booklet to THE NEW DEPARTURE BELL CO., Bristol, Conn., U. S. A.

SUPERIOR TO COTTON WASTE
Endorsed by Fire Underwriters.
Safe, durable, cheaper.
Agents wanted.

RAW SILK MACHINERY WIPERS

Beware of loose woven imitations

AMERICAN SILK MFG. CO.
313 Walnut Street, Philadelphia, Pa.

THE UNIVERSUM CLOCK

represents the Universe. It shows the earth revolving round its axis, giving the time at the point passing the sun, the stars in their proper position, and their rising and setting. ☞ *Send for illus. catalog A.*

UNIVERSUM CLOCK CO.,
1 Beacon Street, Boston, Mass.

The Scientific American PUBLICATIONS FOR 1897.

The prices of the different publications in the United States, Canada, and Mexico are as follows:

RATES BY MAIL.

Scientific American (weekly), one year,	$3.00
Scientific American Supplement (weekly), one year,	5.00
Export Edition of the Scientific American (monthly) in Spanish and English,	3.00
Building Edition of the Scientific American (monthly),	2.50

COMBINED RATES

in the United States, Canada, and Mexico.

Scientific American and Supplement,	7.00
Scientific American and Building Edition,	5.00
Scientific American, the Supplement, and Building Edition,	9.00

TERMS TO FOREIGN COUNTRIES.

The yearly subscription prices of Scientific American publications to **foreign countries** are as follows:

	U. S. Money.	English Money. £ s. d.
Scientific American (weekly),	$4.00	0 16 5
Scientific American Supplement (weekly)	6.00	1 4 8
Building Edition of the Scientific American (monthly),	3.00	0 12 4
Export Edition of the Scientific American (monthly) in Spanish and English,	3.00	0 12 4

COMBINED RATES TO FOREIGN COUNTRIES.

Scientific American and Supplement,	8.50	1 14 11
Scientific American and Building Edition,	6.50	1 6
Scientific American, Scientific American Supplement, and Building Edition,	11.00	2 5 2

☞ *Proportionate Rates for Six Months.*

The above rates include postage, which we pay. Remit by postal or express money order, or draft to order of

MUNN & CO., 361 Broadway, New York.

"JUST AS GOOD AS NEW"

You have the right to examine the work for one whole week; if not entirely satisfactory in every respect you may return it and your money will be refunded.

In making an inventory at the close of our recent Introductory Distribution, we find in stock a few sets of **The Encyclopædic Dictionary** (in cloth and half-Russia bindings only) that are **slightly marred**—not enough to impair their real value, but sufficient to prevent their shipment as perfect stock at our regular prices of $42.00 to $70.00 a set. There being only a limited number of these special sets, we shall not go to the trouble of rebinding them, but have decided to let them go on easy payments of $1 down and $1 a month until paid at **little more than half** our recent very low introductory prices. By **prompt action Now,** therefore, a number of ambitious and deserving readers who desire a strictly up-to-date reference library may secure one of these special sets at about

Cost of Making WHILE THEY LAST

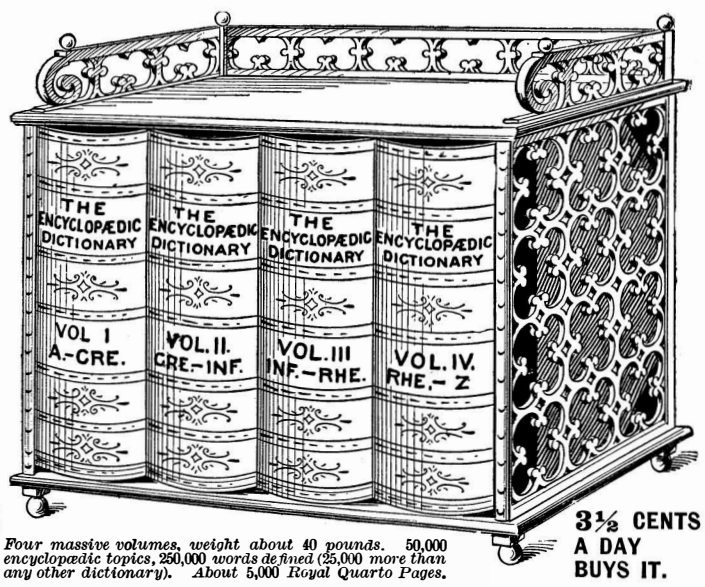
they are yours for a lifetime this easy way

ONLY $1.00

with order and **$1.00** per month until paid.

WE GUARANTEE that these volumes, except for slight rubs or abrasions on the binding, are precisely the same as those sold at full prices. Yet we cannot offer them as perfect stock; and our loss shall be your gain. This is

AT ONCE A DICTIONARY AND AN ENCYCLOPÆDIA.



Four massive volumes, weight about 40 pounds. 50,000 encyclopædic topics, 250,000 words defined (25,000 more than any other dictionary). About 5,000 Royal Quarto Pages.

3½ CENTS A DAY BUYS IT.

Positively the Greatest Bargain ever offered in a strictly high-class standard publication. For those who are trying to "get along" with older and inferior reference works, this is a really wonderful opportunity.

WHAT THE ENCYCLOPÆDIC DICTIONARY IS

It contains over **250,000 defined words**—nearly twice as many as the largest "unabridged"—giving the history, derivation, spelling, pronunciation, and varied meanings of each legitimate English word. It is now accepted as **an unquestioned authority** wherever the English language is spoken.

It is one of the best of all Encyclopædias, because **practically useful** as well as the latest and most scholarly. **50,000** encyclopædic subjects—the Britannica has about 27,000. **Just think of it!** The whole range of human knowledge condensed for your **instant use** by such world-famous scientists as Huxley, Proctor, and a hundred other educators of hardly less renown. It is a **time-saver** for busy men; a **college education** for plodding students; a **brain developer** for ambitious mechanics; an inexhaustible treasurehouse of information for each member of every family. It easily takes the place of any half dozen other reference books that could be named. It is truly a **family necessity.**

It is an ornament to any library; beautifully printed and substantially bound; four great volumes, profusely illustrated, **costing more than $750,000 to produce,** and never before offered (except during our recent introductory sale) for less than **$42.00 to $70.00 a set.**

WHAT THE ABLEST CRITICS SAY

"The Encyclopædic Dictionary is a library condensed into four volumes; a ton of diffusiveness reduced to forty pounds of quintessence."—**Rev. Dr. Chas. H. Parkhurst,** Mar. 9, 1896.

"It forms in itself a library for the busy man of affairs, the mechanic ambitious to advance himself in his line, or the student or apprentice just making a beginning."—**Scientific American,** Aug. 3, 1895.

"Has no superior in any of the qualities that go to make up a good dictionary. I give the work my hearty commendation."—**Ex-Judge Noah Davis,** Mar. 12, 1896.

"The work is undoubtedly an exceedingly useful and trustworthy one."—**Sunday School Times,** May 11, 1895.

"It has all the utility of a superior unabridged dictionary, and all the practical usefulness of a 25-volume encyclopædia without its diffusiveness."—**Ram's Horn,** Nov. 16, 1895.

"The skill and judgment with which the dictionary and encyclopædia have been blended can be appreciated only by comparing The Encyclopædic with other dictionaries."—**Public Opinion,** Sept. 19, 1895.

HOW TO SECURE THIS GREAT BARGAIN

Bring or send $1.00 to the New York Newspaper Syndicate, 93 Fifth Ave., New York, and the entire set of four superb volumes, bound in cloth, will be forwarded. The balance is to be paid at the rate of $1.00 monthly for 12 months. **The first payment for either binding is only $1.** In sending your first payment please designate the style of binding you desire, and indicate how you wish the volumes sent, as the charges for delivery must be paid by the purchaser. Remittances received after disposal cannot last long. To prevent [illegible] we are compelled to limit stock at our must decline to send more than **2 sets** to any one person, and the limited stock at our require the full name and address of each person receiving a set. We have only two styles of binding in this lot—cloth and half-Russia—about an equal quantity of each. **Order at once, to make sure.** The absolute confidence of the Syndicate that the work will be thoroughly appreciated, highly valued and cheerfully paid for is clearly shown by sending such a valuable set of books the subscription price of which is from $42 to $70 on an advance payment of only $1. We refer to any newspaper in New York. **The half-Russia Binding will be supplied for 25c. additional per month.**

REMEMBER

These sets are as good, for all practical purposes, as those for which we are getting regular prices. We guarantee that the interiors are not injured, and the bindings of our standard grade. The most serious injury to use in your own home or office. As absolute proof of this statement you may retain the set for careful examination for one whole week. If not entirely satisfactory you have the right to return to the Syndicate and money will be promptly and cheerfully refunded. *This is positively the chance of a lifetime.*

NEW YORK NEWSPAPER SYNDICATE 93 FIFTH AVENUE, NEW YORK.

LINENE TRADE MARK REVERSIBLE COLLARS AND CUFFS.

MADE OF FINE CLOTH IN ALL POPULAR STYLES.
Equal in Fit and Wear to finest linen
Not to be laundered; when soiled reverse, then discard.
LUXURIOUS and ECONOMICAL.
Sold at all leading Gents' Furnishing Stores, but if not found send **twenty-five cents** for a box of **ten Collars** or **five pairs of Cuffs,** naming the size and style. ☞ *Sample Collar and pair of Cuffs sent for* **6 CENTS.**
REVERSIBLE COLLAR CO. 69 Milk St., Boston, Mass.

RUST On bright metal surfaces, Machinery, Tools, etc., absolutely prevented by using MANNOCITIN. ENDORSED BY LEADING FIRMS. Sample Can, 25c., Postpaid. Otto Goetze, 118 Broad St., New York

MAKE ICE CREAM in 30 seconds. Best, purest, cheapest. From milk only. Saves ice and salt. Made easily with **Polar Star Instant Freezer.** Rapid, clean, economical. Always in order. Freezes with snow, hard, dry and smooth. IT DON'T SCRAPE TIN. *Live agents wanted everywhere.*
Polar Star Mfg. Co., 231 Levant St., Phila., Pa

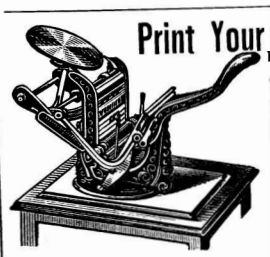
DIXON'S 691 CYCLE CHAIN GRAPHITE saves wear of chain, prevents rust and increases ease, speed and comfort. ☞ It will pay you to send 10 cents for sample.
JOS. DIXON CRUCIBLE CO., JERSEY CITY, N. J.

"TORNADO TOP"
and Whistle Combined.

Brass, nickel plated. No strings or springs. Changes color while going. ☞ Send for circular or 15 cents in stamps for sample. Agents wanted.
J. C. GOODRICH, Detroit, Mich.

TELESCOPES SEND FOR CATALOGUE W. & D. MOGEY. BAYONNE CITY, N.J.

Print Your Own Circulars



business cards, dodgers, etc., or let your boy combine business with amusement and print them for you. Splendid educator for youth and great aid to business men. A full line of hand and self-inking printing presses type and all printing supplies. Write for catalogue. J. F. W. Dorman Co., 121 E. Fayette St., Baltimore.

THE NEW BRISTOL COUNTER

Registers an accurate account of work done on printing presses, grain tallies, weighing, measuring and other automatic machines. Counts up to 1,000,000 and repeats automatically. Simple, accurate, durable. Special counters to order. ☞ *Send for circular.*
C. J. ROOT, Bristol, Conn., U. S. A.

Horse Carts 12 STYLES.
NARROW & WIDE Tires. 2&4 Wheels
Popular Prices. Low rates of freight from our works, Tatamy, Pa., to all points. **HOBSON CO.,** No. 4 Stone St., New York.

ROCK EMERY
Fastest Grinders Known. In Over 600 Factories.
MILLSTONES.
CHEAP, DURABLE.
Grinds Everything.
Diamond Hardness.
☞ *Send for circular.*
Fit any Mill Frame.
STAY SHARP. NO PICKING.
Sturtevant Mill Co.
Boston, Mass.

Est'd 1863. Glass; Brooke, Moulds, Expert Making New Articles. Removed 44 Barclay St., N. Y.

Light and fine machinery to order; models and electrical work specialty. E. O. CHASE, NEWARK, N. J.

ICE MACHINES, Corliss Engines, Brewers, and Bottlers' Machinery. THE VILTER MFG. CO., 899 Clinton Street, Milwaukee, Wis.

Shorthand by Mail Thoroughly taught by reporters. *Catalogue and first lesson Free.* Potts Shorthand College, Williamsport, Pa.

CONTRACTS WANTED.
To manufacture Hardware Specialties, Pat'd Novelties and Sheet Metal Stamping. Lang Mfg. Co., Racine, Wis.

STEEL TYPEWRITER TYPE
TYPE WHEELS. MODELS & EXPERIMENTAL WORK. SMALL MACHINERY NOVELTIES & ETC. NEW YORK STENCIL WORKS 100 NASSAU ST N.Y.

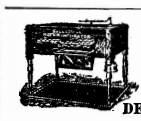
Experimental & Model Work
Circulars & advice free. Gardam & Son, 96 Sohn St., N.Y.

WELL DRILLING AND PROSPECTING
MACHINERY OF HIGHEST GRADE.
LOOMIS CO., Tiffin, Ohio.

$525 Agents profits per month. Will prove it or pay forfeit. New articles just out. A $1.50 sample and terms free. Try us. ELECTROGRAPH CO., 28 Bond St., N.Y

NOVELTY SIGNS Agents wanted to sell ready made **NOVELTY SIGNS.** 150 per cent profit. Great sellers. Catalogue free. Samples 10c. **Val. Schreier, Mfr., Milwaukee, Wis.**

VOLNEY W. MASON & CO.
FRICTION PULLEYS, CLUTCHES, and ELEVATORS
PROVIDENCE, R. I.



THE SUCCESSFUL
Succeeds where others fail—cause why? New system of ventilation; new method of generating moisture; positive action of self regulator. Made so they cannot fail. Catalogue for 6c. in stamps; worth a $.
DES MOINES INC. CO., Box 75, Des Moines, Ia.

WOODEN TANKS.
For Railroads, Mills and Manufactories.
Builders of Steel Towers and Tanks.
La. Red Cypress Wood Tanks a specialty.
W. E. CALDWELL CO.,
217 E. Main Street, Louisville, Ky.

INVENTORS OF SPORTING SPECIALTIES WILL FIND IT OF ADVANTAGE TO CORRESPOND WITH AND SUBMIT THEIR ARTICLES TO H. P. O. BOX 2308 NEW YORK.

WANTED
To correspond with manufacturers who could undertake to build
50 GASOLENE OR KEROSENE MOTORS
for driving ordinary 14 ft. street cars. Also a Gasolene Locomotive for light passenger traffic. Address,
N. Escalante y Peon, Merida, Yucatan, Mexico

WANTED
SUPERINTENDENT, by a large manufacturing company, near New York, a thoroughly capable man to assume entire charge of a department at its works. Only one possessing energy, executive ability and experience in organizing and maintaining a large force of employes need apply, with full particulars and references, by mail only. "Ability," Remington Bros., 309 B'way, N.Y.

CARBORUNDUM HARDEST ABRASIVE KNOWN. EMERY AND DIAMOND POWDER SUBSTITUTE. IN FLOUR, POWDER-CRYSTAL-WHEEL-SLAB & HONE FORM. CARBORUNDUM CO. MONONGAHELA CITY, PA. U.S.A.

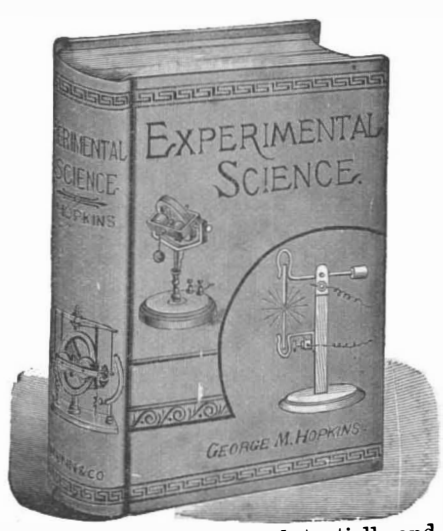
Experimental Science

BY

GEO. M. HOPKINS.

Seventeenth Edition.

REVISED AND ENLARGED.



840 pages, 782 fine cuts, substantially and beautifully bound. Price in cloth, by mail, **$4.** Half morocco, **$5.**

This splendid work is up to the times. It gives young and old something worthy of thought. It has influenced thousands of men in the choice of a career. It will give anyone, young or old, information that will enable him to comprehend the great improvements of the day. It furnishes suggestions for hours of instructive recreation.

Send for illustrated circular and complete table of contents. . . .

MUNN & CO., Publishers,
Office of the . . .
SCIENTIFIC AMERICAN,
361 BROADWAY, - NEW YORK.

© 1896 SCIENTIFIC AMERICAN, INC.

Advertisements.

ORDINARY RATES.

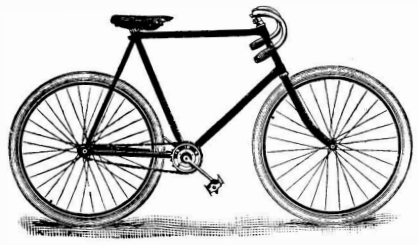
Inside Page, each insertion - - 75 cents a line
Back Page, each insertion - - - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

Tribune Bicycle

Tested and True.



The Easiest Running Wheel in the World.

☞ *Send for Catalogue.*

THE BLACK MFG. CO., ERIE, PA.

Nickel Silver Watches

We are casing all sizes of movements in this new metal. It takes a better finish and is more enduring than sterling.

It supersedes the old nickel plate, and enables one to have a perfect timepiece at small cost.

Our Solid Gold and Filled Cases, as well as Sterling Silver and Enameled patterns, are in greater variety this season than ever.

New specialties have been added.

Our '97 Model

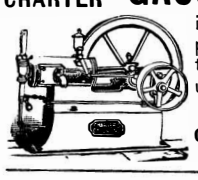
Trump Cyclometer,

the 10,000 mile wheel recorder, are all shown in our new catalogues, which will be sent to all.

The Waterbury Watch Co., Waterbury, Conn.

HELMET OIL LUBRICATES ANYTHING. IF YOU HAVE A HOT BOX TRY IT. C. H. BESLY & CO. CHICAGO. ILL. U.S.A.

THE CHARTER GASOLINE ENGINE



is used for almost every purpose power is applied to under the sun, and is unequaled.

Full particulars by addressing

CHARTER GAS ENGINE CO.
Box 148, Sterling, Ill.

The American Bell Telephone Company,

125 Milk Street,
Boston, Mass.

This Company owns Letters-Patent No. 463,569, granted to Emile Berliner November 17, 1891, for a combined Telegraph and Telephone, covering all forms of Microphone Transmitters or contact Telephones.

TO THOSE INTENDING BUILDING

To insure a perfect and permanent finish on all natural interior woodwork the use of the **WHEELER PATENT WOOD FILLER** is essential. It leaves the wood pores transparent.

AN OUTSIDE PAINT that outlasts lead and oil paints, is **BREINIG'S LITHOGEN SILICATE PAINT**, especially adapted for buildings exposed to salt air.

Architects and owners, in their own interests, should see their specifications carried out in full, and examine bills for the articles specified before accepting work as satisfactory.

References—Most of the leading architects throughout the U. S. Sole manufacturers of the above articles.

THE BRIDGEPORT WOOD FINISHING CO., New Milford, Conn.

New York, 240 Pearl Street. Chicago, 215 E. Lake Street. Boston, 85 Oliver Street.

SHOE'S CUSHION SADDLE

A boon to bicyclists. Provides an ample, safe and comfortable seat. Gives the best protection against organic injury. Made on scientific principles. Guaranteed to give perfect satisfaction after trial. Width 9 in., length 8 in.

PRICE $5.00.

☞ *Illustrated circulars free.*

Star Nickel Plating Wks., 430 Walnut St., Phila., Pa.

AN ADVERTISER

can make **EVERYBODY** read his advertisements **SOME** of the time and **SOMEBODY EVERY TIME**—but he can't make **EVERYBODY** read them **EVERY** time; **UNLESS** he is advertising **SARANAC AND STEAM PROOF BUCKSKIN GLOVES AND MITTENS, the Best in the World, and made ONLY by the SARANAC GLOVE CO. of LITTLETON, N. H.**

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.

AMERICAN PATENTS.—AN INTERESTING and valuable table showing the number of patents granted for the various subjects upon which petitions have been filed from the beginning down to December 31, 1894. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **1002.** Price 10 cents. To be had at this office and from all newsdealers

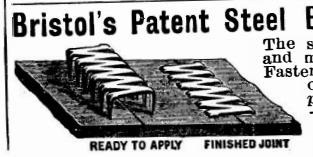
Scientific Book Catalogue

RECENTLY PUBLISHED.

Our New Catalogue containing over 100 pages, including works on more than fifty different subjects. Will be mailed free to any address on application.

MUNN & CO., *Publishers* SCIENTIFIC AMERICAN,
361 Broadway, New York

Bristol's Patent Steel Belt Lacing.



The simplest, cheapest and most perfect Belt Fastening for all kinds of belting. *Samples sent free.*

The Bristol Co.
Waterbury Conn.

PATENTS!

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for inventors.

In this line of business they have had *nearly Fifty years' experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on moderate terms.

A pamphlet, sent free of charge on application, contains full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments. Rejected Cases. Hints on the sale of Patents, etc.

We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing Patents in all the principal countries of the world.

MUNN & CO., SOLICITORS OF PATENTS,
361 BROADWAY, NEW YORK.

BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building, near 7th Street. WASHINGTON, D. C.

PROFIT

Any one who possesses a moderate capital and plenty of push can make money in any locality by giving entertainments and illustrating lectures with a McAllister Magic Lantern or Stereopticon.

There is a constant demand for this class of entertainment by churches, schools, societies, lecturers and amusement bureaus.

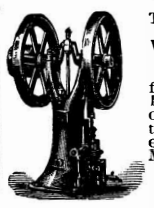
A 250 page book that tells all about

McALLISTER'S MAGIC LANTERNS and STEREOPTICONS

—how to run them, how to give exhibitions—with complete lists of views and accessories, mailed for the asking.

T. H. McALLISTER, 49 Nassau St., N. Y. 76 Washington St., Chicago.

At ¼ Price Bicycles, Watches Guns, Buggies Harness, Sewing Machines Organs Pianos Safes, Tools Scales of all varieties and 1000 other articles. Lists free. CHICAGO SCALE CO., Chicago Ill.



This beats Wind, Steam, or Horse Power. We offer the **WEBSTER 2½** actual horse power

GAS ENGINE

for **$150.** less 10% discount for cash. Built on interchangeable plan. Built of best material. Made in lots of 100 therefore we can make the price. Boxed for shipment, weight 800 pounds. Made for Gas or Gasoline.

☞ *Write for Special Catalogue.*

WEBSTER M'F'G CO.,
1074 West 15th Street, CHICAGO.

POWER? POWER?? POWER!!!

Fifty per cent. increase at no additional expense.

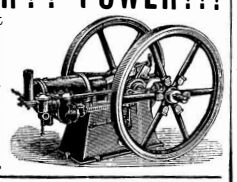
Victor Vapor Engine.

Emphatically the Twentieth Century Gas Engine.

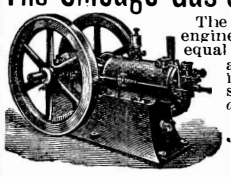
Send stamp for catalogue "A"

Reliable agents wanted.

THOMAS KANE & CO.
64-66 Wabash Ave., Chicago.



The Chicago Gas & Gasoline Engine



The simplest gas and gasoline engine on the market. Has no equal for absolute, steady speed and durability. It is a dwarf in size and a Samson in strength. *Catalogue sent on application.*

MANUFACTURED BY
J. J. NORMAN CO.,
48 "A" South Clinton St.,
CHICAGO, ILL.

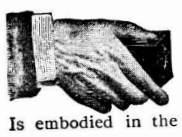
Make Your Work Light!

The comfort of typewriting is never appreciated until you try a

HAMMOND NO. 2

It is easy and elastic to the touch, perfect and permanent in alignment, speedy enough to write 206 words a minute and gives as clear and uniform an impression as if printed. Its durability insures satisfaction and freedom from costs of repair. Its portability recommends it for traveling purposes. But its chief point of excellence is the beauty of its work to which thousands of users can testify.

THE HAMMOND TYPEWRITER CO., 401 East 62d Street, NEW YORK CITY



PHOTOGRAPHIC SIMPLICITY

Is embodied in the Pocket Kodak.

EASTMAN KODAK CO.

Booklet free at agencies or by mail. Rochester, N. Y.

JESSOP'S STEEL THE VERY BEST FOR TOOLS, SAWS ETC.
WM. JESSOP & SONS LTD 91 JOHN ST. NEW YORK

PRIESTMAN SAFETY OIL ENGINE

"A thoroughly successful commercial Engine using a Safe Oil."—Franklin Institute

No Extra Insurance, No Steam, No Gas. No Gasoline. Reliable, Safe, Economical, and Convenient. Chosen by Nine Governments. Used for nearly every purpose.

PRIESTMAN & CO., Incorp'd,
530 Bourse Bldg., PHILADELPHIA, PA.

THE

☞ ESTABLISHED 1845.

The Most Popular Scientific Paper in the World

Only $3.00 a Year, Including Postage.
Weekly—52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete list of Patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year* 52 numbers—postage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of **Three Dollars** by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Postmasters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO., 361 Broadway, New York.

Scientific American Supplement

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT, for the United States, Canada, and Mexico, $5.00 a year; or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year to one address for $7.00. Single copies, 10 cents. Address and remit by postal order, express money order, or check,

MUNN & CO., 361 Broadway, New York.

Building Edition.

THE SCIENTIFIC AMERICAN BUILDING EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid Magazine of Architecture, richly adorned with *elegant plates* and other fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with Floor Plans, Descriptions, Locations, Estimated Cost, etc.

The elegance and cheapness of this magnificent work have won for it the **Largest Circulation** of any Architectural publication in the world. Sold by all newsdealers. $2.50 a year. Remit to

MUNN & CO., 361 Broadway, New York.

Export Edition

of the SCIENTIFIC AMERICAN, with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN is published monthly, and is uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 50 pages, profusely illustrated. It is the finest scientific, industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places *throughout the world*. $3.00 a year, postpaid, to any part of the world. Single copies, 25 cents.

☞ Manufacturers and others who desire to secure foreign trade may have large and handsomely displayed announcements published in this edition at a very moderate cost. Rates upon application.

MUNN & CO., Publishers.
361 Broadway, New York.

PRINTING INKS

The SCIENTIFIC AMERICAN is printed with CHAS. ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York

© 1896 SCIENTIFIC AMERICAN, INC.